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ABSTRACTS AND INDEXES FOR PROCEEDINGS, VOL. 84, 1958

(Proc. Paper 1891)

FOREWORD

This index has been prepared in an effort to supply a list of topic headings as a guide to material published in the Proceedings of ASCE during 1958. The abstracts included herein are presented to indicate to the reader what general information can be found in the paper in question. The author listing has been made as complete as possible and includes the names of co-authors, discussers, and committee chairmen of the several reports. Subject headings have been greatly restricted, for the sake of brevity, under three basic rules:

1. Each paper is listed under one primary heading suggested by the name of the technical divisions of the Society. No other entry is made for the paper if that one entry is considered to be sufficient.

2. A secondary listing is used if further classification is essential. In this second listing an attempt is made to place papers published in one Division's Journal also under another Division's name so that readers of the Journal of one Division can be made aware of other papers that might be of interest to them.

3. A geographic listing (by states of the United States and by foreign countries) is recognized where location is of particular importance.

References to discussers of a given paper can be found immediately under the name of the senior author in the author index. Discussion that occurred in more than one calendar year can be traced by referring to the senior author's name in successive indexes, until the closing remarks are located. If discussion is published in the same year as the paper, the listing of this discussion is made directly after the listing of the paper in the subject index. If the discussion appears in the year following the paper's publication, then the subject indexing of that discussion is made in alphabetical order under the appropriate subject heading.

Typical abbreviations used in this index are: Dsc for "discussion," Clo for "closing discussion," Rt for "report," Corr for "corrections," and Chmn for "chairman" of a committee submitting a report. All numbers refer to the number of the Proceedings Paper, no page numbers are included in this index. Immediately following the Proceedings Paper number, the letter and number

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symbols indicate which of the several Division Journals the particular paper appeared in. By referring to the back inside cover of any Division Journal the month of issue of any Journal can be ascertained.

Items indexed are identified by months as follows:

| <u>Month</u> | <u>Number</u> |
|--------------|---------------------------|
| January | Proc. Papers 1494 to 1527 |
| February | 1528 to 1559 |
| March | 1560 to 1579 |
| April | 1580 to 1620 |
| May | 1621 to 1657 |
| June | 1658 to 1691 |
| July | 1692 to 1724 |
| August | 1725 to 1749 |
| September | 1750 to 1789 |
| October | 1790 to 1832 |
| November | 1833 to 1858 |
| December | 1859 to 1891 |

Journals published during 1958 are as follows:

| <u>Month</u> | <u>Journals</u> |
|--------------|---|
| January | Engineering Mechanics, Highway, Irrigation & Drainage, Structural, Waterways & Harbors |
| February | Hydraulics, Power, Sanitary Engineering, Soil Mechanics & Foundations |
| March | Pipeline, Structural, Waterways & Harbors |
| April | City Planning, Engineering Mechanics, Hydraulics, Irrigations & Drainage, Power, Sanitary Engineering, Surveying & Mapping |
| May | Highway, Soil Mechanics & Foundations, Structural, Waterways & Harbors |
| June | Air Transport, Hydraulics, Pipeline, Power, Sanitary Engineering |
| July | Engineering Mechanics, Sanitary Engineering, Structural, Surveying & Mapping |
| August | Hydraulics, Power, Soil Mechanics & Foundations |
| September | Irrigation & Drainage, Sanitary Engineering, Structural, Waterways & Harbors |
| October | Engineering Mechanics, Highway, Hydraulics, Power, Soil Mechanics & Foundations, Structural |
| November | Hydraulics, Sanitary Engineering, Structural, Surveying & Mapping |
| December | City Planning, Hydraulics, Irrigation & Drainage, Power, Professional Practice, Soil Mechanics & Foundations, Structural, Waterways & Harbors |

SUBJECT INDEX

AFGHANISTAN

- "Rockfill Dams: Kajakai Central Core Dam, Afghanistan" (1735PO4) by Glenn F. Sudman

AIR TRANSPORT

- "Airport Approach, Runway and Taxiway Lighting Systems" (1659AT1) by C. Edward Walter, and Vincent J. Roggeveen
- "The Effects of Air Pollution on Airport Visibility" (1543SA1) by William T. Ingram and Louis C. McCabe
- "Ground Transportation at New York International Airport" (1623HW2) by Richard I. Strickland
- "Municipal Financing of Airports" (1669AT1) by Rollin F. Agard
- "Surveying for Richard I. Bong Air Force Base" (1699SU2) by Peter A. Machinis
- "A Water-Borne Runway" (1658AT1) by David Williams

ANALOGS

- "An Analog Computer for the Oxygen Sag Curve" (1850SA6) by Morton D. Sinkoff, C. Don Geilker and Jan G. Rennerfelt

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- "Analysis of Open-Spandrel Arches" (1564ST2) by A. F. Diwan
- "Numerical Analysis of Two-Hinged Arches" (1758ST5) by Thomas D. Y. Fok and Tung Au

ATOMIC ENERGY

- "Blast Loading on Structures" (1837ST7) by H. L. Murphy
- "Blast Phenomena From a Nuclear Burst" (1836ST7) by Ferd E. Anderson, Jr.
- "Civil Engineering Aspects of the Dresden Nuclear Power Station" (1600PO2) by Joseph E. Love, Chester S. Darrow, and Burr H. Randolph
- "Civil Engineering Aspects of the Fermi Atomic Power Station" (1602PO2) by Pharo C. Burg and John G. Feldes
- "General Considerations for Reactors and Related Plant Types" (1763ST5) by John F. Stolz
- "Insurance Aspects of Nuclear Energy" (1599PO2) by Edward R. Lloyd
- "Hydrological Aspects of Radioactive Waste Disposal" (1835SA6) by William H. Bierschenk
- "Spherical Containment Shell of the Dresden Station" (1601PO2) by L. P. Zick, J. T. Dunn, and J. B. Maher

BEAMS

- "Analysis of Continuous Beams by Carry-Over Moments" (1762ST5) by Jan J. Tuma
- "Analysis of Finite Beams on Elastic Foundation" (1722ST4) by Denos C. Gazis
- "Concrete Beams and Columns with Bundled Reinforcement" (1818ST6) by N. W. Hanson and Hans Reiffenstahl
- "Effect of Deflection on Lateral Buckling Strength" (1596EM2) by J. W. Clark and A. H. Knoll

- "Elasti-Plastic Analysis of Continuous Frames and Beams" (1879ST8) by Lawrence P. Johnson, Jr., and Herbert A. Sawyer, Jr.

- "On Inelastic Buckling in Steel" (1581EM2) by Geerhard Haaijer and Bruno Thurlimann

- "The Location of Maximum Principal Stresses" (1629ST3) by T. Ranov and H. S. Wolko

- "Matrix Analysis of Beams" (1494EM1) by Ray W. Clough

- "Moments in Beams by the Method of Partial Moments" (1567ST2) by Harry Posner

- "Moments in Continuous Beams On Flexible Supports" (1631ST3) by Robert A. Williamson

- "Numerical Solutions for Beams on Elastic Foundations" (1562ST2) by Henry Malter

- "Plastic Design of Cover Plated Continuous Beams" (1495EM1) by E. P. Popov and J. A. Willis

BRIDGES

- Rt: "Deflection Limitation of Bridges: Progress Report of the Committee on Deflection Limitations of Bridges" (1633ST3) C. P. Siess, Chmn

- "Design Features of Lower Deck of George Washington Bridge" (1632ST3) by Irvine P. Gould

- "The Design of the Main Towers of the Mackinac Bridge" (1565ST2) by Kuang-Han Chu

- "Golden Gate Bridge Vibration Studies" (1817ST6) by George S. Vincent

- Rt: "Highway and Bridge Surveys: Introduction to Bridge Surveys and Reconnaissance Survey" Progress Report of the Committee on Highway and Bridge Surveys (1713SU2) Milton O. Schmidt, Chmn.

- "Highway and Bridge Surveys: Preliminary Bridge Surveys. Progress Report of the Committee on Highway and Bridge Surveys" (1842SU3) Milton O. Schmidt, Chmn.

- Rt: "Highway and Bridge Surveys: Reconnaissance, Progress Report of the Committee on Highway and Bridge Surveys" (1593SU1) Milton O. Schmidt, Chmn.

- "Inspection and Tests of Welding of Highway Bridges" (1866ST8) by John L. Beaton

- "Numerical Solutions for Interconnected Bridge Girders" (1815ST6) by Henry Malter

- "Precise Surveys for Mackinac Bridge" (1716SU2) by R. M. Boynton

- "Railroad Bridge Alterations, Calumet-Sag Project" (1641WW3) by George W. Svoboda

BURMA

- "Irrawaddy River System of Burma" (1766WW4) by Henry R. Norman

CALIFORNIA

- "The Haas Hydroelectric Power Project" (1529PO1) by J. Barry Cooke

- "Design and Performance of Vermilion Dam, California" (1728SM3) by K. Terzaghi and T. M. Leps

1879. Elasti-Plastic Analysis of Continuous Frames and Beams, by Lawrence P. Johnson, Jr., and Herbert A. Sawyer, Jr. (ST) An analytical solution considering both elastic and plastic flexural deformations is presented for continuous beams and frames. The method has limitations characteristic of limit design methods except that it determines strength as defined by the moment-curvature relationship as well as an ultimate moment, and allows ready determination of deflections.

1880. Discussion of Proceedings Paper 1197, 1662. (HY) J. Bogardi corrections to 1197. Howard M. Turner on 1662.

1881. Discussion of Proceedings Paper 1645, 1648, 1649, 1654, 1655. (SM) R. G. Ahlvin, D. Hugh Trollope on 1645. A. A. Eremin on 1648. A. A. Eremin on 1649. D. P. Krynnine, Dean R. Freitag on 1654. J. MacNeil Turnbull on 1655.

1882. Discussion of Proceedings Paper 1638, 1708, 1709, 1710, 1712. (ST) B. R. Cooke on 1638. Arthur N. Gilbert on 1708. Arthur N. Gilbert on 1709. Arthur N. Gilbert on 1710. Arthur N. Gilbert, Louis Balog on 1712.

1883. Discussion of Proceedings Paper 1486. (PP) K. E. McKee on 1486.

1884. Discussion of Proceedings Paper 1514, 1568, 1571. (WW) Louis H. Foote closure to 1514. C. L. Bretschneider corrections to 1568. J. E. Chapplear on 1568. Basil W. Wilson on 1571.

1885. Discussion of Proceedings Paper 1620. (CP) Nathan Cherniack, William H. Clare, Joseph Horowitz on 1620. Sergei N. Grimm Closure to 1620.

1886. Las Morochas Gas Turbine Power Plant, by A. J. Michael. (PO) This paper presents civil engineering aspects of gas turbine power plants which are different

from the more conventional type of thermal power plant.

1887. Civil Engineering Features of TVA Steam Electric Stations, by George P. Palo, Walter F. Emmons, and Nathan E. Way. (PO) Since 1949 the TVA has built seven large steam electric stations. This paper presents features which are of interest in the design of steam plants.

1888. Ocean Cooling Water System for 800 MW Power Station, by Robert H. Weight. (PO) The use of ocean water for cooling must provide for corrosion effects and control of fish and marine growth. This paper describes model studies assuring economical control and handling of water quantities used, with consideration to earthquake and subsidence.

1889. Water Supply to Thermal Power Plants, by E. J. Stankiewicz. (PO) This paper examines water quantities required, sources, circulating water systems and uses, and reviews the water supply systems for several power stations.

1890. Experiments on Self-Aerated Flow in Open Channels, by Lorenz G. Straub and Alvin G. Anderson. (HY) Measurements of air-concentration distribution in high velocity open-channel flows indicate that air content can be related to the flow characteristics and can be described by turbulence concepts.

1891. Abstracts and Index to Proceedings, Volume 84 (1958), by the Board of Direction. (BD) A list of abstracts and a subject and author index have been prepared for all Proceedings Papers published in 1958; the numbers covered are 1494 to 1890. The subject-headings used were taken from the names of the technical divisions of the Society; other headings were added when deemed necessary. By use of the author index, it is possible to trace all the discussion that a paper has received.

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- *Rockfill Dams: Cherry Valley Central Core Dam" (1733PO4) by H. E. Lloyd, O. L. Moore and W. F. Getts
- *Rockfill Dams: Salt Springs and Lower Bear River Concrete Dams" (1737PO4) by I. C. Steele and J. B. Cooke
- *Rockfill Dams: Wishon and Courtright Concrete Face Dams" (1746PO4) by J. Barry Cooke
- *Sewage Disposal in Santa Monica Bay, California" (1534SA1) by C. G. Gunnerson

CANADA

- *Road Development in Ontario" (1524HW1) by W. J. Fulton
- *Rockfill Dams: The Bersimis Sloping Core Dams" (1740PO4) by F. W. Patterson and D. H. MacDonald
- *Underground Power Plants in Canada (1670PO3) by A. W. F. McQueen, C. N. Simpson and I. W. McCaig

CITY PLANNING

- Rt: "City Planning Education for the Civil Engineer: Progress Report of the Committee on Education" (1877CP2) Lloyd Rader, Chmn.
- *Integrated Planning of Highways and City Streets" (1628HW2) by Guy Kelcey and George Leland
- *Organization of Metropolitan Districts" (1680SA3) by Langdon Pearse
- *Some Aspects of Urban Planning" (1620CP1) by Sergei N. Grimm

COLORADO

- *Montgomery Dam--Rock Fill with Asphaltic Concrete Deck" (1556PO1) by F. W. Scheidenhelm, John B. Snethlage and Arthur N. Vanderlip

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- *Approximate Buckling Loads of Open Columns" (1793EM4) by Yu-kweng M. Lin
- *Biaxially Loaded Reinforced Concrete Columns" (1865ST8) by Kuang-Han Chu and Aigis Parbaci
- *Concrete Beams and Columns with Bundled Reinforcement" (1818ST6) by N. W. Hanson and Hans Reiffenstahl
- *Design of Long Reinforced Concrete Columns" (1694ST4) by Bengt Broms and I. M. Viest
- *Eccentrically-Loaded, Hinged Steel Columns" (1792EM4) by R. E. Mason, G. P. Fisher and Geo. Winter (1792EM4)
- *Lateral Bracing of Columns and Beams" (1561ST2) by George Winter
- *Lateral Load Analysis of Two-Column Bents" (1638ST3) by John E. Goldberg
- *Ultimate Strength Analysis of Long Restrained Reinforced Concrete Columns" (1635ST3) by Bengt Broms and I. M. Viest

COMPUTERS

- *An Analog Computer for the Oxygen Sag Curve" (1850SA6) by Morton D. Sinkoff, C. Don Gelker and Jan G. Rennerfelt
- *Columbia Basin Streamflow Routing by Computer" (1874WW5) by David M. Rockwood

- *Computation of the Stability of Slopes" (1824SM4) by Otto H. Meyer
- *Digital Computation for Stiffness Matrix" (1814ST6) by J. S. Archer
- *Digital Computers Applied to Pipeline Design" (1575PL1) by Harold E. Thomas
- *Digital Computers for Pipeline Network Analysis" (1608SA2) by Quintin B. Graves and Don Branscome
- *High-Speed Computer Applied to Bridge Impact" (1759ST5) by Charles T. G. Looney
- *Hydraulic Problem Solution on Electronic Computers" (1515WW1) by Edward A. Lawler and Frank U. Druml
- *Mechanical Analogs Aid Graphical Flood Routing" (1585HY2) by Max A. Kohler
- *Rigid Frame Analysis With The Aid of Digital Computers" (1634ST3) by E. Czerniak
- *Use of Modern Computer in Structural Analysis" (1636ST3) by Ray W. Clough
- *Water Distribution Design and the McIlroy Network Analyzer" (1588HY2) by M. B. McPherson and J. V. Radziul
- *Water Distribution Problems Solved by Network Calculators" (1577PL1) by L. M. Haupt

CONCRETE

- *Incremental Compression Test for Cement Research" (1604EM2) by A. Hrennikoff
- *A Method of Design of Reinforced Concrete Sections" (1509ST1) by Panagiotis D. Molotidis
- *Reinforcement in Continuous Concrete Pavements" (1799HW3) by Vedat A. Yellici
- *Review of Limit Design for Structural Concrete" (1878ST8) by C. W. Yu and Eivind Hognestad
- *The Structural Properties of Magnetite Concrete" (1511ST1) by Jerome M. Raphael
- Rt: "Tentative Recommendations for Prestressed Concrete: Report of the Joint ACI-ASCE Committee on Prestressed Reinforced Concrete" (1519ST1) Thor Gerundsson, Chmn.
- *Tests of Concrete Pavements on Gravel Subbases" (1800HW3) by L. D. Childs and J. W. Kapernick
- *Thermal Consideration in the Design of Concrete Shields" (1755ST5) by Harold S. Davis
- *Ultimate Strength Analysis of Long Hinged Reinforced Concrete Columns" (1510ST1) by Bengt Broms and I. M. Viest

CONNECTICUT

- *Connecticut Highways and the 1955 Floods" (1621HW2) by Newman E. Argraves

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- *The Engineering and Worldwide Conservation of Soil and Water" (1775IR3) by Orson W. Israelsen

CONSTRUCTION

- *Glued Laminated Wood Construction in Europe" (1840ST7) by M. L. Selbo and A. C. Knauss
- *Waterfront Structure Design For Varying Conditions" (1639WW3) by William C. Stevens and John S. Wilson

DAMS

- *Box Canyon Hydroelectric Project" (1672PO3) by Arthur P. Geuss
- *Design and Construction of the Ambuklao Rock Fill Dam" (1864SM5) by E. Montford Fucik and Robert F. Edbrooke
- *Design and Performance of Vermilion Dam, California" (1728SM3) by K. Terzaghi, T. M. Leps
- *Grouting Deep Solution Channels Under an Earth Fill Dam" (1813SM4) by Leland F. Grant and Lewis A. Schmidt, Jr.
- *Montgomery Dam--Rock Fill with Asphaltic Concrete Deck" (1556PO1) by F. W. Scheidenhelm, John B. Snethlage, and Arthur N. Vanderlip
- *The Pelton Hydro-Electric Development" (1823PO5) by J. M. Mullarky
- *Pore Pressure in Concrete Dams" (1597PO2) by Chong-Hung Zee
- *Predicting Seepage Under Dams on Multi-Layered Foundations" (1727SM3) by Paul H. Shea and Harry E. Whitsett
- *Rockfill Dams: The Bersimis Sloping Core Dams" (1740PO4) by F. W. Patterson and D. H. MacDonald
- *Rockfill Dams: Brownlee Sloping Core Dam" (1734PO4) by Torald Mundal
- *Rockfill Dams: Cherry Valley Central Core Dam" (1733PO4) by H. E. Lloyd, O. L. Moore and W. F. Getts
- *Rockfill Dams: Cogswell and San Gabriel Dams" (1687PO3) by Paul Baumann
- *Rockfill Dams: The Dalles Closure Dam" (1738PO4) by Robert J. Pope
- *Rockfill Dams: Dams with Sloping Earth Cores" (1743PO4) by James P. Growdon
- *Rockfill Dams: The Derbendi Khan Dam" (1741PO4) by Calvin V. Davis
- *Rockfill Dams: Design of Cougar Central Core Dam (1749PO4) by Paul Thurber
- *Rockfill Dams: Kajakai Central Core Dam, Afghanistan" (1735PO4) by Glenn F. Sudman
- *Rockfill Dams: Kenney and Cheakamus Dams" (1671PO3) by William G. Huber
- *Rockfill Dams: Nantahala Sloping Core Dam" (1742PO4) by James P. Growdon
- *Rockfill Dams: The Paradel Concrete Face Dam" (1747PO4) by Luis Henrique Gomes Fernandes, Edgard de Oliveira, and Nuno de Vasconcelos Porto
- *Rockfill Dams: The Paradel Dam--Foundation Treatment" (1748PO4) by Walter J. Weyermann
- *Rockfill Dams: Performance and Maintenance of Dix River Dam" (1683PO2) by Lewis A. Schmidt, Jr.
- *Rockfill Dams: Performance of Mud Mountain Dam" (1745PO4) by Allen S. Cary
- *Rockfill Dams: Performance of Seven Sloping Core Dams" (1744PO4) by James P. Growdon
- *Rockfill Dams: Performance of TVA Central Core Dams" (1736PO4) by George K. Leonard and Oliver H. Raine
- *Rockfill Dams: Review and Statistics" (1739PO4) by John B. Snethlage, F. W. Scheidenhelm and Arthur N. Vanderlip
- *Rockfill Dams: Salt Springs and Lower Bear River Concrete Dam" (1737PO4) by I. C. Steele and J. B. Cooke

- *Rockfill Dams: Wishon and Courtright Concrete Face Dams" (1746PO4) by J. Barry Cooke

DRAINAGE

- *Analysis of Partially Penetrating Sand Drains" (1812SM4) by E. G. Hart, R. L. Kondner and W. C. Boyer
- Clo. (1784IR3) to "Drainage in the Mississippi River Valley" (1363IR2) See Louis W. Herndon
- Dsc (1784IR3) of "Drainage in the Mississippi River Valley" (1363IR2) See Louis W. Herndon
- *Drainage in Relation to a Permanent Irrigation Agriculture" (1506IR1) by C. R. Maierhofer
- *Model Approach to a Groundwater Problem" (1862IR4) by Kenneth R. Wright
- *Statewide Water Planning" (1861IR4) by Harvey O. Banks
- *USBR's Lower-Cost Canal Lining Program" (1589IR2) by R. J. Willson
- *Water Yields as Influenced by Watershed Management" (1590IR2) by Robert H. Burgy

EARTHQUAKES

- *Earthquake Design Criteria For Stack-Like Structures" (1696ST4) by John E. Rinne
- *Earthquake Response of Elevated Tanks and Vessels" (1563ST2) by Donald F. Moran and James A. Cheney
- *Effects of Ground on Destructiveness of Large Earthquakes" (1730SM3) by C. Martin Duke
- *Structural Dynamics in Earthquake-Resistant Design" (1695ST4) by John A. Blume

ECONOMICS

- *Municipal Financing of Airports" (1669AT1) by Rollin F. Agard
- *Statewide Water Planning" (1861IR4) by Harvey O. Banks

EDUCATION

- Rt: "City Planning Education for the Civil Engineer: Progress Report of the Committee on Education" (1877CP2) Lloyd Rader, Chmn.
- *Education in Surveying and Photogrammetry in Europe" (1720SU2) by G. Gracie and H. Karara
- *Engineering Education as it Affects Unity in the Profession" (1869PP1) by Frederick C. Lindvall
- *Importance of Emphasis in Civil Engineering Education" (1871PP1) by L. E. Grinter
- *Pity the Poor Professors?--or Propagate Them!" (1870PP1) by J. E. McKee
- *Sanitary Engineers: The Need and the Securing" (1705SA4) by Frank A. Butrico and Mark D. Hollis
- Rt: "Six Thousand High School Students View Engineering and Scientific Careers: Report of the Student Activities Committee, San Diego Section" (1868PP1) Bert C. Wilkas, Chmn.
- *Sputniks, Flopniks, and Engineering Education" (1872PP1) by C. Ken Weidner

EGYPT

- *The Suez Canal--Its Chronicle and Bibliography" (1770WW4) by Shu T'ien Li

ELECTRONICS

- *Digital Computers Applied to Pipeline Design" (1575PL1) by Harold E. Thomas

ELECTRONICS

- *"The Geodimeter and Tellurometer" (1617SU1) by Austin C. Poling
- *"Hydraulic Problem Solution on Electronic Computers" (1515WW1) by Edward A. Lawler and Frank U. Druml
- *"Water Distribution Problems Solved by Network Calculators" (1577PL1) by L. M. Haupt

ENGINEERING MECHANICS

- *"Approximate Buckling Loads of Open Columns" (1793EM4) by Yu-kweng M. Lin
- *"Bending of Elastically Supported Rectangular Plates" (1719EM3) by Melvin Zaid and Marvin Forray
- Clo (1520EM1) to "The Boundary Layer Development in Open Channels (1138EM1) See Delleur, J. W.
- Clo (1520EM1) to "A Pressure Line Concept for Inelastic Bending" (1157EM1) See Baron, Frank
- Clo (1619EM2) to "Wind Induced Vibration of Cylindrical Structures" (1141EM1) See Penzien, Joseph
- Clo (1619EM2) to "Bending of a Rectangular Plate with One Free Edge" (1196EM2) See Nachbar, W.
- Clo (1619EM2) to "Deflections of Structures in the Inelastic Range" (1290EM3) See Gerstle, Kurt H.
- Clo (1831EM4) to "Demonstrations of Plastic Behavior of Steel Frames" (1390EM4) See H. M. Nelson
- Clo (1831EM4) to "Analysis of Continuous Beams" (1399EM4) See Seng-Lip Lee
- Dsc (1520EM1) of "The Boundary Layer Development in Open Channels" (1138EM1) See Delleur, J. W.
- Dsc (1520EM1) of "Deflections of Structures in the Inelastic Range" (1290EM3) See Gerstle, Kurt H.
- Dsc (1520EM1) of "The Lateral Rigidity of Suspension Bridges" (1292EM3) See Silverman, I. K.
- Dsc (1520EM1) of "Analysis of Continuous Beams by Fourier Series" (1399EM4) See Lee, Seng-Lip
- Dsc (1619EM2) of "Demonstrations of Plastic Behavior of Steel Frames" (1390EM4) See Nelson, H. M.
- *"Dynamic Analysis and Response of Aircraft Arresting Systems" (1580EM2) by Robert S. Ayre and Joel I. Abrams
- *"Dynamic Effect of a Moving Load on a Rigid Frame" (1794EM4) by R. C. DeHart
- *"Dynamic Elasto-Plastic Response of Rigid Frames" (1693EM3) by Frank L. DiMaggio
- *"Eccentrically-Loaded, Hinged Steel Columns" (1792EM4) by R. E. Mason, G. P. Fisher and Geo. Winter
- *"Effect of Deflection on Lateral Buckling Strength" (1596EM2) by J. W. Clark and A. H. Knoll
- *"Effect of End-Fixity on the Vibration of Rods" (1791EM4) by D. Burgreen
- *"Effective Width of Thin Rectangular Plates" (1718EM3) by Morris Ojalvo and Frederick H. Hull

- *"Incremental Compression Test for Cement Research" (1604EM2) by A. Hrennikoff
- *"Large Deflection of Elasto-Plastic Plates Under Uniform Pressure" (1822EM4) by Thien Wah
- *"Limit Analysis of Simply Supported Circular Shell Roofs" (1706EM3) by M. N. Fialkow
- *"Matrix Analysis of Beams" (1494EM1) by Ray W. Clough
- *"Minimum Weight of Frames Under Shakedown Loading" (1790EM4) by Jacques Heyman
- *"On Inelastic Buckling in Steel" (1581EM2) by Geerhard Haaijer and Bruno Thurlimann
- *"Plastic Design of Cover Plated Continuous Beams" (1495EM1) by E. P. Popov and J. A. Willis
- *"Sea Bottom Pressure Fields Produced by Yawed Vessels" (1496EM1) by P. M. Fitzpatrick
- *"Strong Cylindrical Bending of Elastic Plates" (1692EM3) by S. J. Medwadowski, and K. S. Pister

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- *"Glued Laminated Wood Construction in Europe" (1840ST7) by M. L. Selbo and A. C. Knauss

FLOODS

- *"Flood Control in New England" (1517WW1) by Alden K. Sibley
- *"Northeastern Floods of 1955: Flood Control Hydrology" (1663HY3) by Elliot F. Childs
- *"Northeastern Floods of 1955: Meteorology of the Floods" (1661HY3) by Charles S. Gilman and Kendall R. Peterson
- *"Northeastern Floods of 1955: Rainfall and Runoff" (1662HY3) by Tate Dalrymple
- *"Synthetic Flood Frequency" (1808HY5) by Franklin F. Snyder

FOUNDATIONS

- *"Cement and Clay Grouting of Foundations: Experience of TVA with Clay-Cement and Related Grouts" (1552SM1) by George K. Leonard and Leland F. Grant
- *"Cement and Clay Grouting of Foundations: French Grouting Practice" (1550SM1) by Armand Mayer
- *"Cement and Clay Grouting of Foundations: Grouting with Clay-Cement Grouts" (1545SM1) by Stanley J. Johnson
- *"Cement and Clay Grouting of Foundations: Practice of the Corps of Engineers" (1551SM1) by Edward B. Burwell, Jr.
- *"Cement and Clay Grouting of Foundations: Present Status of Pressure Grouting Foundations" (1544SM1) by A. Warren Simonds
- *"Cement and Clay Grouting of Foundations: Pressure Grouting with Packers" (1549SM1) by Fred H. Lippold
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- LIPPOLD, FRED H.
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- "Design Details for Individual Sewage Disposal Systems" (1715SA4)

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- "Eccentrically-Loaded, Hinged Steel Columns" (1792EM4) with G. P. Fisher and Geo. Winter

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- Dsc (1855SA6) of "Advances in Secondary Processes of Sewage Treatment in the Period October 1, 1954 to June 1, 1957" (1612SA2)

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- Dsc of 1563ST2: A. A. Eremin (1787ST5)

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- MORGAN, PAUL E.
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- NACHBAR, W.
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O'CONNOR, DONALD J.

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Dsc (1616HY2) of "The Hydraulic Design of Stilling Basins: Short Stilling Basin for Canal Structures, Small Outlet Works, and Small Spillways (Basin III)" (1403HY5)

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ABSTRACTS

January

1494. Matrix Analysis of Beams, by Ray W. Clough. (EM) The application of a matrix procedure to the analysis of structures consisting of flexural members is presented in this paper. Four examples demonstrate the application of the method to various types of structures.

1495. Plastic Design of Cover-Plated Continuous Beams, by E. P. Popov and J. A. Willis. (EM) According to the plastic method of design, an infinite number of alternative designs of cover-plated continuous beams for the same applied load is possible. Several designs of two-span continuous beams were made, and experimental evidence was obtained to serve as justification for this method of design.

1496. Sea Bottom Pressure Fields Produced by Yawed Vessels, by P. M. Fitzpatrick. (EM) The flow around a stationary ellipsoid immersed in a semi-infinite fluid medium is examined. Approximation equations are given for the pressure distribution on the plane boundary and a procedure for obtaining constant pressure contours is presented.

1497. Teamwork in the Solution of Water Problems, by Harvey O. Banks. (IR) This paper presents aspects of teamwork in the uses of water, considering teamwork among agencies, and between professional groups and the public.

1498. Engineering in the Soil Conservation Service, by C. J. Francis. (IR) This paper outlines engineering activities of the Soil Conservation Service. Emphasis is placed on the engineering aspects of the new Watershed Protection and Flood Prevention Program, Public Law 566, which is administered by the Soil Conservation Service.

1499. Can Evaporation Losses be Reduced? by Earl Harbeck, Jr. (IR) A number of methods of minimizing evaporation losses are presented in this paper. Two methods that warrant intensive study are the use of a monomolecular film, such as hexadecanol, on the water surface, and the use of ground-water reservoirs for storage.

1500. Water Supply Versus Irrigation in Humid Areas, by M. C. Boyer. (IR) Watershed inventories are necessary to assure maximum beneficial use of the water supply, and to determine the present and future needs. White River Basin, Indiana, is so inventoried.

1501. Resolving Conflicting Demands for Water, by Samuel B. Morris. (IR) In arid areas of the world such as those of the Nile and Colorado Rivers, irrigation use creates major international problems. Domestic-industrial use can give the most benefits, but advanced planning is necessary to avoid conflicts.

1502. Importance of Phreatophytes in Water Supply, by C. B. Thompson. (IR) This paper outlines the occurrence and spread of salt cedar (tamarisk) over 440,000 acres in New Mexico. Water use and methods of eradication and control are examined.

1503. Factors Affecting the Useful Life of Reservoirs, by Carl B. Brown. (IR) The useful life of reservoirs includes length of life and service value. Controlling factors in reservoir silting are the capacity-inflow ratio and sediment content of inflow, which is governed by watershed characteristics. Flexibility in design and site conservation through proper project formulation is urged.

1504. Influence of Climate on Irrigation Agriculture, by Wayne D. Criddle. (IR) Climate is the major factor that determines whether irrigation is necessary in an area. Growing season rainfall may limit the amount of irrigation water needed, but may also create problems that do not exist where summer rainfall is scarce.

1505. Hydraulic Properties of Perforated Well Casings, by Yoash Vaadia and Verne H. Scott. (IR) This paper deals with the hydraulic performance of well casings of varied perforation characteristics. Several commercially perforated casings were tested in combination with various gravel envelopes. Results are presented and compared with criteria already available for well screens.

1506. Drainage in Relation to a Permanent Irrigation Agriculture, by C. R. Maierhofer. (IR) After trying for some 5,000 years to establish a permanent irrigation agriculture in arid lands, man finally has the knowledge and tools to assure success. Selecting lands for permanent productivity under irrigation is one practical answer.

1507. Methods of Computing Consumptive Use of Water, by Wayne D. Criddle. (IR) The more generally used methods for computing consumptive water requirements of crops are summarized, and data and charts that may simplify the application of methods are presented.

1508. Design of Folded Plate Roofs, by Howard Simpson. (ST) The procedure for the analysis of a single-span folded plate structure is reviewed and analyzed with the aid of an illustrative example. The effects of relative displacements of the longitudinal edges are considered.

1509. A Method of Design of Reinforced Concrete Sections, by Panagiotis D. Moliotis. (ST) A general solution is given in this paper of the calculation of any section of reinforced concrete with a symmetry axis, eccentrically loaded.

1510. Ultimate Strength Analysis of Long Hinged Reinforced Concrete Columns, by B. Broms and I. M. Viest. (ST) Theoretical analyses of the strength of slender concentrically and eccentrically loaded columns are presented and compared with existing test data. Both the effect of bucklings and the increase of eccentricity caused by deflections are taken into account.

1511. The Structural Properties of Magnetite Concrete, by Jerome M. Raphael. (ST) Structural design of a magnetite-concrete reactor shield depends on elastic and volumetric properties of the material. Principles are given for proportioning concrete mixtures made of crushed magnetite. Tests are described to establish the suitability of mixture under temperature and moisture conditions of the reactor, as well as elastic properties for design of steel reinforcement.

1512. Design of Masonry Walls for Blast Loading, by K. R. McKee and E. Sevin. (ST) The arching action theory of masonry walls is applied to the problem of blast resistant design. An equation of motion is developed for a masonry beam of solid cross section restrained by essentially rigid supports. Comparison is made with test data for walls subjected to full scale atomic and high explosive blasts.

1513. New Retractable Marine Fender System, by Palmer W. Roberts and Virgil Blancato. (ST) This paper presents details of a retractable marine fender system of a continuous timber vertical member and horizontal wale frame suspended by bolts in slotted

brackets fastened to the pier. The outstanding qualifications of this system are large energy absorption, economy and permanence.

1514. The Columbia River Controlled, by Louis H. Foote. (WW) Planning by the Corps of Engineers for development of the water resources of the Columbia River Basin will consider changed conditions and needs since the Corps' report of 1948. This paper outlines these changes and the problems being encountered in providing long-range plans for resource development.

1515. Hydraulic Problem Solution on Electronic Computers, by Edward A. Lawler and Frank U. Druml. (WW) Applications are presented of three types of electronic computers, demonstrating the wide range of problems solved by these instruments. Tedious methods of solution are replaced by more accurate methods, thus freeing the engineer for true engineering problems.

1516. Closure of the Breach in Bayocean Peninsula, Oregon, by Harlan E. Brown, Jr., Gerald D. Clark, and Robert J. Pope. (WW) This paper examines the design and construction of rock and sand fill closure structures for Bayocean Peninsula, a natural barrier between Tillamook Bay and the Pacific Ocean, which was breached by storm waves.

1517. Flood Control in New England, by Alden K. Sibley. (WW) This paper considers flood-control methods employed for protection against both river and tidal flooding as related to the unique topographic, hydrologic, and economic characteristics of New England.

1518. St. Lawrence Seaway, 27-ft Canals and Channels, by W. Grothaus and D. M. Ripley. (WW) A historical summary of the 27-ft St. Lawrence Seaway is followed by an examination of the criteria adopted in design of the Seaway. Dams, locks, and channels of the project are presented with reference to these hydraulic criteria.

1519. Tentative Recommendations for Prestressed Concrete: Report of the Joint ACI-ASCE Committee on Prestressed Reinforced Concrete. (ST) The objective of this report is to recommend those practices in design and construction which will result in prestressed concrete structures that are comparable both in safety and in serviceability to constructions in other materials now commonly used.

1520. Discussion of Proceedings Paper 1136, 1157, 1290, 1292, 1399. (EM) Yoshiaki Iwasa, Alfred C. Ingersoll, Masashi Hom-ma

on 1138. J. W. Delleur closure to 1138. Frank Baron closure to 1157. John H. Percy on 1290. Arne Selberg on 1292. S. J. Medwadowski on 1399.

1521. Discussion of Proceedings Paper 1104, 1105. (IR) Harry F. Blaney closure to 1104. George H. Hargreaves closure to 1105.

1522. Discussion of Proceedings Paper 1055, 1101, 1146, 1147, 1149, 1150, 1151, 1189, 1255, 1302, 1303, 1304, 1309, 1312, 1313, 1315, 1316, 1318, 1320, 1353, 1357, 1433. (ST) P. B. Morice and H. E. Lewis closure to 1055. No closure notice to 1101. Harry H. Hill closure to 1146. Frank Baron closure to 1147. Nan-Sze Sih closure to 1149. E. Chesson, Jr. and W. H. Munse closure to 1150. Harry Subkowsky closure to 1151. Eivind Hognestad closure to 1189. Louis Balog on 1255. Douglas T. Wright on 1302. H. S. Makowski, Thomas D. Y. Fok on 1303. P. W. Abeles on 1304. Irving Sherman on 1309. S. K. Ghaswala on 1312. A. Zaslavsky on 1313. E. Neil W. Lane on 1315. Milos Vorlicek and Jan Suchy, Ernest Basler, Rene E. Walther on 1316. Yeshayahu Etkin on 1318. Herbert A. Sawyer, Douglas T. Wright, Michael E. Fiore and Thomas R. Kuesel, Henri Perrin on 1320. Kurt H. Gerstle on 1353. E. Neil W. Lane on 1357. E. George Stern on 1433.

1523. Discussion of Proceedings Paper 1119, 1208, 1211. (WW) Alexander H. Kenigberg closure to 1119. Otakar W. Kabelac closure to 1208. R. Silvester on 1211.

1524. Road Development in Ontario, by W. J. Fulton. (HW) Results of an engineering study which estimates the highway needs of Ontario for the next twenty years are given in brief. Organization of Department of Highways is outlined.

1525. Adaptability of Interchange Types on Interstate System, by Jack E. Leisch. (HW) This paper recommends types of interchanges based on analyses and comparisons of operational features and capacity potentials. A scheme is presented to provide operational uniformity in conjunction with exits on the interstate system of highways.

1526. Discussion of Proceedings Paper 1090, 1250, 1372, 1385. (HW) Paul Hartman closure to 1090. G. I. Sawyer on 1250. T. F. Hickerson on 1372. H. A. Abdun-Nur on 1385.

1527. The Administrative Role of the Federal Government in the Interstate System, by Frank C. Turner. (HW) Because it is not possible for 67 million motor vehicles to stay within the boundaries that have been set up to subdivide residents in urban areas, more

effective cooperation must be developed across these boundaries if the highway program provided by the Federal Aid Highway Act of 1956 is to bring needed traffic relief.

February

1528. Turbulence Characteristics of the Hydraulic Jump, by Hunter Rouse, T. T. Siao, and S. Nagaratnam. (HY) Hot-wire measurements of turbulence in an air-flow model of the hydraulic jump are described for Froude numbers of 2, 4, and 6. Results are analyzed and interpreted in the light of momentum and energy integrals.

1529. The Haas Hydroelectric Power Project, by J. Barry Cooke. (PO) Engineering considerations, design criteria, and construction data for a high head hydroelectric project are presented. The features of this project are an underground power house, a 290-ft-high rockfill dam, an unlined pressure tunnel, and multiple-jet, vertical-shaft impulse turbines.

1530. The Total Sediment Load of Streams, by Emmett M. Laursen. (HY) Relationships are proposed that give the quantity and quality of the total, suspended, and bed loads as functions of the stream and sediment characteristics. In the process of empirically defining the relationships, a correlation of laboratory and field data was obtained.

1531. Sediment Transport in Money Creek, by J. B. Stall, N. L. Rupani, and P. K. Kandaswamy. (HY) A hydraulic study was made of Money Creek and sediment capacity determined by the Einstein, Schoklitsch and DuBoys formula. Utilizing flow duration information, the total quantity of bed material moved is calculated. Actual bed material size sediment is compared with the sediment transport.

1532. Field Investigations of Spillways and Outlet Works, by Benson Guyton. (HY) Included in the Corps of Engineers hydraulic field testing program are flood-control and multiple-purpose projects, river and harbor works, and estuarine and wave problems. Test data examined include spillway, conduit-intake, and gate-leaf pressures; air demand, and concrete friction factors.

1533. Media Characteristics in Water Filtration, by Gaurchandra Ghosh. (SA) A study has been made on the effect of media characteristics in water filtration. Data are presented

which show that the current ideas regarding turbidity penetration and removal of turbidity in the top layers of the filter are misconceptions.

1534. Sewage Disposal in Santa Monica Bay, California, by C. G. Gunnerson. (SA) The results of receiving water studies made in connection with the expansion of Los Angeles' Hyperion Treatment are reviewed and analyzed in terms of the degree of treatment required for effluent discharged five miles offshore.

1535. Model Study of a Dynamically Loaded Pile, by Roy D. Gaul. (SM) Tests made on a model of a vertical pile in soft soil indicate that a low frequency oscillatory lateral load induces pile bending moments that correspond to moments caused by the same load applied statically. Computation of pile moments appears to agree with dynamic test results.

1536. Dewatering Excavation, Low Sill Structure, Old River, La., by C. I. Mansur and R. I. Kaufman. (SM) This paper presents the results of pumping tests performed to determine the adequacy of a system of deep wells installed to lower the piezometric head in a deep stratum of pervious sand underlying the excavation for the structure.

1537. A Method to Describe Soil Temperature Variation, by E. B. Penrod, W. W. Walton, and D. V. Terrell. (SM) Values for thermal diffusivity, temperature, and temperature amplitude were determined from observed data. These constants were used in an equation to describe the variation of temperature with time at any soil depth. Calculated temperatures and mean observed soil and air temperatures are plotted for comparison.

1538. Discussion of Proceedings Paper 1216, 1285, 1350. (PO) S. Logan Kerr, R. S. Quick on 1216. John Parmakian closure to 1216. G. R. Latham closure to 1285. George A. Whetstone, Stavros N. Nicolau on 1350.

1539. SED Research Report No. 14: A Survey of the Present Status of Refuse Engineering and Development. (SA) Results of the investigations of the professional status of refuse collection and disposal is stated, and data on new developments and improved practice is reviewed. Reference is made to a previous report (SED Research Report No. 11).

1540. SED Research Report No. 15: Possible Contributions by Sanitary Engineers to Air Pollution Research. (SA) The paper reviews lack of research in air pollution among sanitary engineers, in spite of special training. Main features include essential areas of investigation in both the laboratory and field.

1541. SED Special Report: Engineer's Joint Council Policy Statement on Air Pollution and its Control. (SA) This paper covers the development and need for an E.J.C. statement on air pollution, and certain principles of air pollution, general considerations, causes and methods of control.

1542. Water Quality in the Missouri River, by Glen J. Hopkins and Joe K. Neel. (SA) The paper examines the quality of water in the Missouri River from the standpoint of reservoir influences and pollutional influences. Factors considered are turbidity, hardness, alkalinity, and algae. Bibliography.

1543. The Effects of Air Pollution on Airport Visibility, by William T. Ingram and Louis C. McCabe. (SA) Air pollution seriously impairs visibility at New York City airports. Possible sources of pollution are given, and related meteorological conditions are described. It is brought out that until improvement in airport visibility is achieved, flights must depend on instrument flying during periods of critical visibility.

1544. Cement and Clay Grouting of Foundations: Present Status of Pressure Grouting Foundations, by A. Warren Simonds. (SM) Present-day uses of pressure groutings are described. Recent developments and improvements of drilling and grouting equipment, and also of grouting materials are mentioned. Examples of successful grouting are cited where core drilling has produced rock cores from foundations with cracks and seams well filled and bonded with cement grout.

1545. Cement and Clay Grouting of Foundations: Grouting with Clay-Cement Grouts, by Stanley J. Johnson. (SM) The uses of suspension grouts consisting of soil or soil and cement are reviewed, with a discussion of the design of grout mixtures.

1546. Cement and Clay Grouting of Foundations: The Use of Clay in Pressure Grouting, by Glebe A. Kravetz. (SM) This paper reviews properties, preparations, and testing of clay, clay-chemical, clay-cement, and clay-sand-cement grouts. Field techniques are cited.

1547. Cement and Clay Grouting of Foundations: The Use of Admixtures in Cement Grouts, by Alexander Klein and Milos Polivka. (SM) Aspects of the use of admixtures are presented with respect to grout mixtures. Types of admixtures, test equipment, and methods of testing are examined. Typical relationships among grout properties are illustrated.

1548. Cement and Clay Grouting of Foundations: Suggested Specifications for Pressure Grouting, by Judson P. Elston. (SM) In the field of foundation treatment, it is improbable that all problems arising during construction can be anticipated by the designer or specification writer. A workable and equitable specification can be resolved from previous experience and practices, geological data, design criteria, and the capabilities of the engineer confronted with a new foundation site.

1549. Cement and Clay Grouting of Foundations: Pressure Grouting with Packers, by Fred H. Lippold. (SM) The use of packers for controlling the injection of grout into a rock foundation is presented. A description of common types of packers currently being used is given, with comments on their adaptability to rock foundations. Advantages and disadvantages of the procedure are cited.

1550. Cement and Clay Grouting of Foundations: French Grouting Practice, by Armand Mayer. (SM) European experience has indicated that clay and clay cement grouts can be utilized to successfully control seepage through alluvial materials. Descriptions of foundation conditions, grouting programs and nature of the grout mix are given for four projects: Genissiat cofferdam, Fessenheim open pit, Ait Ouarda cofferdam, and Serre-Poncon dam.

1551. Cement and Clay Grouting of Foundations: Practice of the Corps of Engineers, by Edward B. Burwell. (SM) The cement grouting practice of the Corps of Engineers during the last decade has adhered closely to a well-established pattern of design and procedure. This paper outlines this practice, and the current grouting specifications requirements of the Corps.

1552. Cement and Clay Grouting of Foundations: Experience of TVA with Clay-Cement and Related Grouts, by George K. Leonard and Leland F. Grant. (SM) Most of the dams built by the TVA have required large amounts of grouting for foundation preparation. Clay-cement grout has been used where feasible, and it has been possible to obtain safe and watertight foundations at a much lower cost than by using usual neat-cement grout.

1553. Trajectory Bucket-Type Energy Dissipators, by E. A. Elevatorski. (PO) Factors in the design of trajectory bucket-type energy dissipators are given in this paper, with data from model and prototype tests. For all con-

templated structures recourse to laboratory model studies should be made to refine or verify the merits of each design.

1554. Underground Power Houses in Italy and Other Countries, by Claudio Marcello. (PO) This paper presents the characteristics of a number of underground power houses mainly constructed in Italy on the writer's design or with his cooperation. The criteria aiding in the choice of the solutions adopted are given special attention.

1555. The Sudagai Underground Power Plant, Japan, by Tatsuo Mizukoshi. (PO) A description of the Sudagai project is presented, with attention given to costs and methods of excavation and concreting, model studies, and seismic forces.

1556. Montgomery Dam—Rock Fill with Asphaltic Concrete Deck, by F. W. Scheidenhelm, John B. Snetlage, and Arthur N. Vanderlip. (PO) This paper describes various aspects of design and construction of a rock-fill dam with an asphaltic concrete deck. The advantages and economy of this type of dam construction are cited.

1557. Discussion of Proceedings Paper 1078, 1115, 1178, 1224, 1274, 1336. (SA) No closure notice to 1078. Donald J. O'Connor and William E. Dobbins closure to 1115. John R. Snell closure to 1178. Marvin L. Granstrom closure to 1224. Tsung-Lien Chou on 1274. Leon E. Chase on 1336.

1558. Discussion of Proceedings Paper 882, 1038, 1162, 1166, 1167, 1197, 1202, 1260, 1262, 1266, 1331, 1332, 1345, 1395. (HY) No closure notice to 882. Hunter Rouse closure to 1038. A. M. Moore closure to 1162. David K. Todd closure to 1166. M. B. McPherson, H. S. Strausser, and J. C. Williams, Jr., closure to 1167. Vito A. Vanoni and Norman H. Brooks; E. Roy Tinney; M. L. Albertson, D. B. Simons, and E. V. Richardson on 1197. John F. Neville closure to 1202. Mushtaq Ahmad on 1260. Corrections to 1262. Gale B. Dougherty on 1266. T. Blench on 1331. M. B. McPherson on 1332. F. V. A. Engel on 1345. H. C. Riggs on 1395.

1559. Discussion of Proceedings Paper 1143, 1161, 1301, 1309, 1427, 1428. (SM) Elbert E. Esmiol closure to 1143. T. H. Wu closure to 1161. Yoshichika Nishida on 1301. Irving Sherman on 1309. Edward S. Barber on 1427. Edward S. Barber on 1428.

March

1560. Analysis of Braced Frames, by Kurt H. Gerstle. (ST) A method of analysis for knee-braced frames is presented. Values of fixed support forces, distribution factors, and carry-over factors are given. Procedure is explained by means of an example problem.

1561. Lateral Bracing of Columns and Beams, by George Winter. (ST) It is often necessary to determine the characteristics required of lateral bracing to counteract buckling of columns and beams. An elementary method is developed for calculating lower limits of strength and rigidity of lateral support in order to provide full bracing. This is defined as equivalent to immovable support.

1562. Numerical Solutions for Beams on Elastic Foundations, by Henry Malter. (ST) Two methods for the solution of beams on elastic foundations are considered. One is a step-by-step integration process and the other, using finite difference equations, obtains a solution by a set of simultaneous equations. Examples are solved and comparisons made between the results.

1563. Earthquake Response of Elevated Tanks and Vessels, by Donald F. Moran and James A. Cheney. (ST) Recent western United States earthquakes, while not as severe as can be expected to occur, have provided tests of many structures specifically designed to resist earthquake forces. A method of analysis is considered where minor damage to elevated water tank towers and refinery vessels can be explained.

1564. Analysis of Open-Spandrel Arches, by A. F. Diwan. (ST) This paper presents a mathematical solution for the open-spandrel arch. The solution is based on the principle of balancing the panel moments by imposing therein a special type of panel distortion which produces moments of a known pattern in the chords of the deformed panel only.

1565. The Design of the Main Towers of the Mackinac Bridge, by Kuang-Han Chu. (ST) Design aspects of the main towers of the Mackinac Straits Bridge are described in this paper. Design specifications are introduced, and principles of preliminary design are examined. Loading conditions, methods used, and results obtained in the final analysis are presented. Design aspects of details are also described.

1566. An Elastic Criterion for Plastic Design, by Herbert A. Sawyer, Jr. (ST) The significance of the elastic limit to deflection, local

instability, and plastic fatigue in plastic design is investigated. An elastic limit criterion for plastic design is proposed.

1567. Moments in Restrained or Continuous Beams by the Method of Partial Moments, by Harry Posner. (ST) This paper presents a method of obtaining moments in beams by obtaining moments at each support with loading placed on one span at a time, and getting the moments at each support with all the spans loaded by combining these moments.

1568. Selection of Design Wave for Offshore Structures, by Charles L. Bretschneider. (WW) Methods are presented for the selection of the design wave, crest elevation, wave length, and maximum horizontal particle velocity at the crest for offshore structures. Wave data supplemented by wave theory are used for the development of generalized graphs for use with waves of finite height.

1569. Shipboard Hydraulic Breakwater, by R. A. Dilley. (WW) A model hydraulic breakwater was constructed on a 1:86.5 scale model Liberty Ship. Curves depicting the relationship between wave attenuation and jet flow, and the dependence of mooring forces on wave height are given.

1570. The Welland Canal, By W. A. O'Neil. (WW) The history of this Canadian canal is given from its inception in 1824. Planning criteria, detailed design information, and traffic data are presented. Original construction methods, maintenance problems, and solutions are examined. Plans are described for deepening the canal to St. Lawrence Seaway standards.

1571. Forces Induced on a Large Vessel by Surge, by John T. O'Brien and D. I. Kuchenreuther. (WW) Field measurements are presented of forces up to 40 kips induced by head-on standing waves of 1 and 2½ minute periods in lines of a 12,000-ton ship moored by unusually taut lines.

1572. Contractor's Planning for Navigation Locks, by F. J. Larkin. (WW) This paper deals with job planning for navigation locks and is concerned with selection of a construction plant. The construction of the Markland Locks Project on the Ohio River for the Corps of Engineers serves as an illustration.

1573. Breaking Wave Force Prediction, by R. L. Wiegell and R. E. Skjel. (WW) Laboratory data of the kinematics of waves breaking on a model beach are analyzed. Resulting wave

particle velocities and accelerations are used in the Morison-O'Brien-Johnson-Schaaf wave force theory to predict the force field for piles of three different diameters. Comparisons of results with predictions from a modified solitary wave theory are given.

1574. Pipeline Location Surveys, by Earl K. Monteith. (PL) The many problems faced by the locating engineer are varied, and the economics of any pipeline project are affected by decisions made in the field. This paper deals with the most common problems of the locating engineer.

1575. Digital Computers Applied to Pipeline Design, by Harold E. Thomas. (PL) This paper, in examining the application of digital computers to pipeline design problems, stresses the possibility of evaluating solutions under varying conditions in order to select the most desirable design.

1576. Discussion of Proceedings Paper 1187, 1188, 1190, 1303, 1353, 1355, 1356, 1357, 1431, 1432, 1434, 1510. (ST) Benjamin C. F. Wei closure to 1187. E. Czerniak closure to 1188. Haaren A. Miklofsky and Omar J. Sotillo closure to 1190. Louis Balog on 1303. Thomas C. Coleman, Thomas D. Y. Fok on 1353. Herbert S. Saffir on 1355. Kuang-Han Chu, Myle J. Holley and Vitelmo Bertero, I. Earl Lewis, Jr. on 1356. Bruce G. Johnston, Paul J. Brennan on 1357. Kuang-Han Chu on 1431. Paul Spindel on 1432. James M. Gere, Joseph J. Hromadik, D. A. Mackenzie, A. A. Eremin on 1434. G. C. Ernst on 1510.

1577. Water Distribution Problems Solved by Network Calculators, by L. M. Haupt. (PL) The alternating current network calculator is an analogue computer that can be adapted to the solution of pipeline distribution problems. This paper describes the use of this computer on this type of problem.

1578. Discussion of Proceedings Paper 1195. (PL) Robert D. Kersten and Edwin J. Waller closure to 1195.

1579. Discussion of Proceedings Paper 1366. (WW) Samuel Heyman, Cevdet Z. Erzen on 1366.

April, 1958

1580. Dynamic Analysis and Response of Aircraft Arresting Systems, by Robert S. Ayre and Joel I. Abrams. (EM) An analysis of aircraft arresting systems, as lumped parameter systems omitting the effect of wave travel in the cable is presented. Comparison with small-

scale experimental results, and response spectra of maximum cable tension under a wide range of operating conditions are included.

1581. On Inelastic Buckling in Steel, by Geerhard Haaijer and Bruno Thurlimann. (EM) A theoretical and experimental study on inelastic buckling of steel columns and plates is presented, including results of tests on model columns, angles and wide-flange beams. Recommendations are given for required geometric proportions of wide-flange shapes in plastic design.

1582. Eisenhower and Grass River Lock Models, by Martin E. Nelson and Harvey J. Johnson. (HY) The lock models described in this paper simulated, to a scale of 1 to 24.24, (model to prototype), upper and lower approach channels and lock chambers. The hydraulic systems consist of intake ports in the upper gate sill, culverts and ports in the chamber walls, and lateral culvert diffusers in the lower approach.

1583. Thermal Density Underflow Diversion, Kingston Steam Plant, by Rex A. Elder and Gale B. Dougherty. (HY) The solution to the diversion of cold thermally stratified density underflows up a side river channel and through a canal whose bottom is higher than the channel is presented.

1584. Submerged Sluice Control of Stratified Flow, by Donald R. F. Harleman, Robert S. Gooch, and Arthur T. Ippen. (HY) Results are presented of experimental and analytical studies on the selective withdrawal of water from reservoirs or rivers in which density stratifications due to thermal or other effects occur.

1585. Mechanical Analogs Aid Graphical Flood Routing, by Max A. Kohler. (HY) Graphical techniques for routing directly on the plotted hydrograph charts are described, and mechanical analogs facilitating graphical solutions are examined. An analog has been constructed which will accommodate the use of graphical relations for inflow versus lag, and storage versus outflow.

1586. Tidal Movement in the Cape Cod Canal, Massachusetts, by B. W. Wilcox. (HY) Variations in the form of the tide wave at selected points, analyses of observations to obtain harmonic constants, and a method for predicting tidal currents in the canal are presented. Diagrams show the shapes of the tide curve.

1587. Distribution of Sediment in Large Reservoirs, by Whitney M. Borland and Carl R. Miller. (HY) The factors affecting the sediment distribution in a reservoir are examined and two methods are presented by which the probable distribution can be predicted.

1588. Water Distribution Design and The McIlroy Network Analyzer, by M. B. Mc-

Pherson and J. V. Radziul. (HY) The paper illustrates time-distribution of demand rates, design rates and equalizing storage requirements for certain Philadelphia districts. Efficacy of perfectly-balanced system characteristics and utilization of the McIlroy Analyzer for design in Philadelphia are described. Merits of different types of computers are compared.

1589. USBR's Lower-Cost Canal Lining Program, by R. J. Willson. (IR) This paper describes the growing problem of water deficiency in the west and examines several methods of lining waterways to alleviate water loss. Advantages and disadvantages of each method are cited.

1590. Water Yields as Influenced by Watershed Management, by Robert H. Burgy. (IR) Studies show that appreciable increases in runoff result from replacement of brush by grass. Factors in precipitation disposal relating to influence of watershed vegetation on runoff are examined.

1591. Irrigation in New Jersey, by Robert L. Hardman. (IR) This paper describes the recent rapid growth of irrigation, and examines available water, and experimental studies. The need for protective legislation to control consumptive use of water in humid states is commented on.

1592. Water Intakes in the Detroit River, by Eugene A. Hardin. (SA) A new water supply system will serve the communities of the southeastern part of Wayne County, Michigan. Features are a water intake in the Detroit River and a raw water tunnel extending inland to a pumping station and purification plant. Other intakes of the Detroit River are also examined.

1593. Highway and Bridge Surveys: Reconnaissance, Progress Report of the Committee on Highway and Bridge Surveys. (SU) The importance of good reconnaissance in the selection of new highway routes is underscored. The conduct of reconnaissance is described and essential elements of the reconnaissance report are enumerated.

1594. Geodetic Control for Tropospheric Scatter Antennas, by Max O. Laird and Antonio Aguilar. (SU) This paper examines second and third-order triangulation expansions controlling the aiming of highly directive antennas, boundary, topographic and construction surveys, at radio stations providing public telephones and network television services between the United States and Cuba.

1595. Short Methods in Adjustment of Observations, by M. V. Smirnov and Paul E. Wylie. (SU) Adjustment of observations in one and two variables which must conform to a straight line, natural or logarithmic are considered. Formulas for the adjustment by the method of least squares are presented as a

possible substitute for the formal application of the method.

1596. Effect of Deflection on Lateral Buckling Strength, by J. W. Clark and A. H. Knoll. (EM) The effect on lateral buckling strength of the deflection or curvature that occurs in an initially straight beam or beam-column prior to buckling is investigated. An analytical study of beams and an experimental investigation of beam-columns are presented.

1597. Pore Pressure in Concrete Dams, by Chong-Hung Zee. (PO) This paper analyzes pore pressure in concrete dams. The mechanics of uplift force acting within a concrete body by conceiving the concrete as a space frame structural body are examined.

1598. Ambuklao Underground Power Station, by Andrew Eberhardt. (PO) Power features of the Ambuklao Project in the Philippines are described. An underground power station was constructed at a site which offered complex rock conditions. A feature of this power station is the horizontal shaft setting of the generating units.

1599. Insurance Aspects of Nuclear Energy, by Edward K. Lloyd. (PO) The paper presents an insight into nuclear energy insurance. Syndicates or insurance pools formed to write insurance on nuclear facilities are described in detail. Insurance rates for nuclear risks and amounts of insurance available to industry are explained.

1600. Civil Engineering Aspects of the Dresden Nuclear Power Station, by Joseph E. Love, Chester S. Darrow, and Burr H. Randolph. (PO) Design considerations arising from the layout of nuclear power equipment within a vaportight sphere are examined. Problems of more conventional nature are related to nuclear power plant design.

1601. The Spherical Containment Shell of the Dresden Station, by L. P. Zick, J. T. Dunn, and J. B. Maher. (PO) Problems encountered in the fabrication and erection of a spherical pressure vessel are presented. Special features are a containment housing around a nuclear power plant including a dual support system, access locks and unusual shell penetrations.

1602. Civil Engineering Aspects of the Fermi Atomic Power Station, by Pharo C. Burg and John G. Feldes. (PO) This paper describes processes employed in converting atomic energy into electricity at the Enrico Fermi Atomic Power Station. Arrangement of equipment and design considerations are examined, showing effect and relation to site development and structures housing principal equipment.

1603. Densities and Compaction Rates of Deposited Sediment, by Victor A. Koelzer and Joe M. Lara. (HY) This paper presents a

review of important work concerning density and consolidation of deposited sediment as related to reservoir deposits. Attention is given to work in soil mechanics that has application in sediment consolidation.

1604. Incremental Compression Test for Cement Research, by A. Hrennikoff. (EM) This paper describes a compression test of cement and concrete that separates immediate deformation from creep. This determines elastic and inelastic characteristics describing the stress-strain properties of material and the internal mechanics of deformation and failure under load.

1605. Discussion of Proceedings Paper 1306. (SU) J C Carpenter on 1306.

1606. A National Water Quality Basic Data Program, by Ralph C. Palange and Stephen Megregian. (SA) This paper presents the Public Health program for collection of data on water quality, providing chemical, biological, and radiological analyses of the nation's water resources on a long-term basis.

1607. Water Intakes in the Niagara River and Lake Ontario, by Raymond H. N. Murray. (SA) This paper examines design conditions of the intakes for the towns of Tonawanda and Oswego, New York, and covers the intake cribs and lines.

1608. Digital Computers for Pipeline Network Analysis, by Quintin B. Graves and Don Branscome. (SA) This paper on digital computers for the solution of pipeline network problems sets forth one of the recent developments which should provide added economy in engineering design.

1609. Maintenance of Fine Bubble Diffusion, by Philip F. Morgan. (SA) Diffuser media for air diffusion may be clogged externally by a number of specific materials, and internally by particulate matter in the air supply. Procedures to control external clogging and a new air quality standard to eliminate internal clogging are presented.

1610. SED Research Report No. 16: Refuse Composting Experience in the Netherlands. (SA) Results of the Netherlands pioneering work in large scale municipal refuse composting through a government financed agency are reviewed.

1611. SED Research Report No. 17: Color Removal from Azo Dye Wastes. (SA) The efficiencies of treating ten azo dyes with stannous chloride for color removal have been determined. Color may be removed by heating the dye waste in the presence of stannous chloride, a powerful reducing agent.

1612. Advances in Secondary Processes of Sewage Treatments in the Period, October

1, 1954 to June 1, 1957. Report by the Subcommittee—Section III of the Committee on Sewerage and Sewage Treatment. (SA) This paper examines secondary processes such as activated sludge, trickling filters and stabilization ponds. Factors of design and operation are reviewed and statements on radioactive and detergent materials are cited.

1613. A Study of Sewage Collection and Disposal in Fringe Areas: Progress Report of the Committee on Public Health Activities of the Sanitary Engineering Division. (SA) The accelerated growth of the urban fringe around American cities during the last three decades has created problems in providing community facilities. Providing these services is a challenge to professional groups and the public.

1614. Discussion of Proceedings Paper 928, 1408, 1411, 1461. (SA) Edwin A. Wells, Jr., and Harold B. Gotaas closure to 928. D. I. H. Barr on 1408. P. R. Krige, G. H. Teletzke on 1411. John S. Wiley closure to 1411. John W. Cunningham on 1461.

1615. Discussion of Proceedings Paper 1236, 1352, 1359, 1360, 1362, 1499, 1507. (IR) H. W. Adams closure to 1236. Harry F. Blaney on 1352. Robert O. Thomas on 1359. R. G. Cox, Steponas Kolupaila and John F. Kennedy on 1360. O. Starosolszky, Steponas Kolupaila, Armando Balloffet on 1362. Robert O. Thomas on 1499. Robert O. Thomas on 1507.

1616. Discussion of Proceedings Paper 1199, 1200, 1331, 1393, 1395, 1401, 1402, 1403, 1405, 1401-1406, 1401 and 1405, 1406, 1453. (HY) R. L. Wiegel, K. H. Beebe, and James Moon closure to 1199. Benjamin A. Whisler and Charles J. Smith closure to 1200. Vito A. Vanoni, Hsin-Kuan Liu on 1331. Theodor S. Strelkoff on 1393. G. N. Alexander, Max A. Kohler, Ralph W. Powell on 1395. E. A. Elewatorski, A. Rylands Thomas on 1401. A. Rylands Thomas on 1402. A. Rylands Thomas on 1403. A. Rylands Thomas, Earl J. Beck on 1405. W. H. R. Nimmo, Walter Rand on 1401-1406. Solano Vega-Vischi on 1401 and 1405. John R. Argue on 1406. Turgut Sarpkaya on 1453.

1617. The Geodimeter and Tellurometer, by Austin C. Poling. (SU) These electronic distance measuring instruments are examined relative to basic electronic principles. Methods of field operation are given. Line measurements with the geodimeter are compared with those obtained by other methods and accuracies are described.

1618. Discussion of Proceedings Paper 1397, 1398, 1414, 1420, 1488. (PO) F. L.

Lawton on 1397. F. L. Lawton on 1398. M. H. Benson on 1414. Joseph R. Bowman on 1420. Clifton W. Bolieau on 1488.

1619. Discussion of Proceedings Paper 1141, 1196, 1290, 1390, 1495. (EM) Joseph Penzien closure to 1141. W. Nachbar closure to 1196. Kurt H. Gerstle closure to 1290. Zdenek Sobotka on 1390. Douglas T. Wright on 1495.

1620. Some Aspects of Urban Planning, by Sergei N. Grimm. (CP) This paper analyzes the urban planning concept, land use planning and its relation to transportation, planning of industrial and residential areas and community facilities, and coordinated use of regulatory and other devices for the guidance of land development.

May

1621. Connecticut Highways and the 1955 Floods, by Newman E. Argraves. (HW) Details of emergency and long-term restoration of the structures and road locations damaged or destroyed by the 1955 floods are presented in this paper.

1622. The Role of the State in the Highway Program, by Rex M. Whitton. (HW) This paper presents the functions of the state in carrying out the expanded federal aid highway program. Program planning, location and plan development, supervision of construction, and maintenance of the system are examined in relation to the state.

1623. Ground Transportation at New York International Airport, by Richard I. Strickland. (HW) A new concept in airport terminals resulted in a 655-acre "Terminal City" which will include 10 passenger terminal buildings, 10 miles of two-lane roads, and multiple parking facilities. Basic planning data and design of the roadway system are presented.

1624. Application of Interstate Highway Design Standards, by J. C. Young. (HW) Minimum design standards set up to govern design and construction of the Interstate Highway System are examined, with reference to their applications.

1625. Continuous Origin and Destination Traffic Surveys, by S. T. Hitchcock. (HW) A system of collecting origin and destination information on a continuing basis using a permanent staff and statistical methods already adopted in continuous traffic counting programs would provide reliable information with technique improvement and possible reduction on costs.

1626. Quality Control for Large Highway Projects, by E. A. Abdun-Nur. (HW) This paper describes an approach to quality control dictated by factors inherent in large-scale accelerated programs, and stresses application of control to materials and construction operations.

1627. Correlation of Geometric Design and Directional Signing, by George M. Webb. (HW) Directional signing must be given consideration during the earliest planning and design stages. This requires that engineers be fully cognizant of each other's problems. This paper examines these factors and presents certain basic principles for guidance of all concerned.

1628. Integrated Planning of Highways and City Streets, by Guy Kecey and George Leland. (HW) The paper illustrates integrated planning of a system of arterial highways and city streets in a metropolitan region, with aspects of development assuring future growth and economic well-being of the region considered.

1629. The Location of Maximum Principal Stresses, by T. Ranov and H. S. Wolko. (ST) Principal normal and shearing stresses in transversely loaded beams have extrema between neutral axis and most distant fiber when the "load-section" parameter M/Vk has values between certain limits which depend on the geometry of the cross section. These limits are presented for rectangular sections and for commonly used I-beam profiles.

1630. The New Art of Fabrication Engineering, by Frederick H. McDonald. (ST) Fabrication engineering is presented as a new subject in education and for the control of design in practice. It is defined as the art of determining the materials, methods and places of assembly to assure maximum use and competitive values for the products of engineering design.

1631. Moments in Continuous Beams on Flexible Supports, by Robert A. Williamson. (ST) A procedure is given for determining end moments in continuous beams on elastically deflecting supports by balancing the angle changes resulting from introducing imaginary hinges at supports. Moments are obtained by successive corrections re-establishing continuity. Application is illustrated by a numerical example.

1632. Design Features of Lower Deck of George Washington Bridge, by Irvine P. Gould. (ST) The addition of a lower deck for the George Washington Bridge follows the concepts of the original designers. The bridge expansion will take place without exceeding the contemplated design loads. The approaches must be modified and built with minimum interference to the 36,000,000 vehicles using the bridge annually.

1633. Report of Committee on Deflection Limitations of Bridges. (ST) This paper reviews the history and purpose of limitations on

span-depth ratio and deflection-span ratio of the AASHTO Specifications for Highway Bridges. Dynamics of bridge vibration from both the structural and psychological point of view are examined.

1634. Rigid Frame Analysis with the Aid of Digital Computers, by E. Czerniak. (ST) This paper shows how rigid frame type structures may be analyzed through existing general purpose mathematical programs. Examples including a multibay gabled bent and lean-to frames with tapered girders demonstrate the simplicity of the method. Effects of foundation settlement, shrinkage, and temperature changes are included.

1635. Ultimate Strength Analysis of Long Restrained Reinforced Concrete Columns, by Bengt Broms and I. M. Viest. (ST) Theoretical analyses, based on idealized stress-strain diagrams for concrete and steel, are presented for the strength of slender concentrically and eccentrically loaded columns restrained at both ends. The effects of end restraints, of the increase of eccentricity caused by deflections and of buckling are taken into account.

1636. Use of Modern Computers in Structural Analysis, by Ray W. Clough. (ST) The paper reviews considerations involved in performing structural analyses by electronic digital computers. A scheme for handling calculations by a series of matrix operations is given, and a bibliography on matrix and computer analyses of structures is included.

1637. Specifications for Preservative Treatment of Timber: Progress Report of a Subcommittee of the Committee on Timber Structures. (ST) The purpose of this report is to provide recommendations for the application of various types of preservative in addition to brief descriptions of the preservatives currently in common usage.

1638. Lateral Load Analysis of Two-Column Bents, by John E. Goldberg. (ST) Simple equations involving only joint rotations are presented for symmetrical two-column bents subjected to lateral loads. Iterative, algebraic and composite solutions are demonstrated.

1639. Waterfront Structure Design for Varying Conditions, by W. C. Stevens and J. S. Wilson. (WW) A review of the different designs of pier and wharf structures constructed by the Port of New York Authority during the past ten years is presented. Effects of site conditions and functional requirements on each of six major projects are examined and resulting construction described.

1640. Wave Run-Up on Roughened and Permeable Slopes, by Rudolph P. Savage. (WW) Laboratory tests determining run-up on various beach slopes as a result of wave action

are described. Curves relating the run-up to wave steepness, slope roughness, and slope permeability are presented.

1641. Railroad Bridge Alterations, Calumet-Sag Project, by George W. Svoboda. (WW) The widening of the Calumet-Sag project waterway requires the alteration of numerous railroad bridges whose expense is shared by bridge owners and the federal government. Problems from the standpoint of cost apportionment, planning, and negotiation of construction agreements with bridge owners are detailed and complex.

1642. Calumet River Lock, Calumet-Sag Project, Illinois, by W. J. Santana and E. G. Hoffmann. (WW) This new navigation lock will involve departures from usual design in that lock walls and guide walls will be of steel sheet piling construction, with concrete construction being limited to gate blocks. Lock gates will be of the sector type, with a total span of 110 feet.

1643. Calumet-Sag Navigation Project, by John B. W. Corey. (WW) A serious obstacle to navigation on the Illinois Waterway will be removed when improvements to the Calumet-Sag Channel have been completed. Barge tows four times larger than present will then be able to connect with deep-draft navigation at Lake Calumet.

1644. Stability of Coastal Inlets, by Per Bruun and F. Gerritsen. (WW) Existing theories of the relationship between tidal range, tidal prism, and inlet cross section are reviewed and compared. Data on inlets and the effect of the quantity and type of littoral material on inlet action are examined.

1645. Increased Resistance to Deformation of Clay Caused by Repeated Loading, by H. B. Seed, R. L. McNeill and J. de Guenin. (SM) The influence of stress history in the form of a series of repeated stress applications, in increasing the resistance to deformation of compacted specimens of silty clay is described. The significance of results in assessing the design life of highway pavements is reviewed.

1646. Geology and Soils of the Newark (N. J.) Metropolitan Area, by Alfreds R. Jumikis. (SM) This paper examines major soil types encountered in the glaciated Newark area, presents physical properties of the glacial soils, and indicates the practical applications of engineering soil maps.

1647. Development of Multiple-Wheel CBR Design Criteria, by C. R. Foster and R. G. Ahlvin. (SM) This paper presents an improved method for developing multiple-wheel CBR design criteria from proven single-wheel criteria. The development of the method and its applications are illustrated.

1648. Symposium on Geological Factors in Tunnel Construction: Tools and Techniques, by Arthur B. Cleaves. (SM) Types of geologi-

cal investigations essential to delineating potential tunnel problems, and new core boring aids are described.

1649. Symposium on Geological Factors in Tunnel Construction: Geology and Tunnel Design, by A. B. Reeves. (SM) The geologist-engineer relationship in tunnel design and construction is outlined. Methods of investigation, selection of tunnel location, and factors to be considered in the preparation of designs and specifications for tunnels are examined.

1650. Symposium on Geological Factors in Tunnel Construction: Geophysical Investigations for the Lehigh Tunnel, by H. LeRoy Scharon and Arthur B. Cleaves. (SM) This paper describes investigations conducted in the portal areas of the Lehigh Tunnel on the Pennsylvania Turnpike System which were made for the purpose of indicating the approximate depths to solid bedrock.

1651. A New Rubberized Asphalt for Roads, by J. York Welborn and John F. Babashak, Jr. (HW) This paper shows that the addition of minute quantities of sulfur to natural rubber latex during blending greatly improves the properties of rubberized asphalt. Asphalt prepared by this method should reflect in improved performance when used for surface treatment.

1652. Discussion of Proceedings Paper 1250, 1374, 1380, 1385, 1525, 1625. (HW) Scott H. Lathrop and Francis J. Farias closure to 1250. Charles E. De Leuw, Karl Moskowitz on 1374. Paul L. Nichols on 1380. José A. J. Salas and V. Escario on 1385. G. D. Love on 1525. J. C. Carpenter on 1625.

1653. Discussion of Proceedings Paper 1211, 1514. (WW) J. W. Johnson closure to 1211. Roy F. Bessey on 1514.

1654. The Structure of Compacted Clay, by T. W. Lambe. (SM) This paper describes the nature of clay structure, a term referring to the arrangement of particles and the electrical forces acting between them. The effects of forces and environmental factors on structure are inferred from the principles of colloid chemistry and crystal chemistry.

1655. The Engineering Behavior of Compacted Clay, by T. W. Lambe. (SM) This paper employs the principles of colloid chemistry and crystal chemistry to give a physical explanation of the engineering behavior of compacted clay. The relationship between clay structure and behavior is described and illustrated with experimental data.

1656. Discussion of Proceedings Paper 1057, 1100, 1233, 1234, 1254, 1255, 1312, 1315, 1354, 1356, 1433, 1434, 1436, 1437, 1519, 1560, 1561, 1565. (ST) Alfred L. Parme closure to 1057. No closure notice to 1100. E. Neil W. Lane corrections to discussion, T. F. Hickerson closure to 1233. Guillermo Villena closure to 1234. Jack R. Benjamin and Harry A. Williams closure to 1254. Ardis White and William B. Purnell closure to 1255. J. M. Pickett closure to 1312. T. Y. Lin closure to 1315. E. Neil W. Lane on 1354. Kuang-Han Chu corrections to discussion, I. M. Nelidov on 1356. John Steinbrugge on 1433. F. J. Tamanini, Howard H. Mullins, R. E. Bowles, Robert B. Harris, Albert D. M. Lewis on 1434. James I. Rooney, A. A. Eremin on 1436. A. S. Hall, Alan M. C. Holmes corrections, Victor R. Bergman on 1437. A. W. Coutris, T. Y. Lin on 1519. George D. Siegfried on 1560. William Zuk on 1561. Kuang-Han Chu corrections to 1565.

1657. Discussion of Proceedings Paper 941, 1160, 1204, 1205, 1299, 1301, 1427, 1428, 1429, 1439, 1537, 1545. (SM) Ray W. Clough and David Pirtz closure to 941. Eben Vey closure to 1160. Milos Polivka, Leslie P. Witte, and John P. Gnaedinger closure to 1204. Jack W. Hilf closure to 1205. No closure notice to 1299. S. J. Johnson on 1301. F. E. Richart, Jr. closure to 1301. D. P. Krynnine on 1427. Jacques de Medina, F. L. D. Wooltorton, S. F. Gizienski on 1428. John A. Trantina on 1429. A. A. Eremin on 1439. D. C. Pearce on 1537. Robert W. Cunney on 1545.

JUNE

1658. A Water-Borne Runway, by David Williams. (AT) This paper describes a method of building a runway in which the concrete surface is supported on shallow thin-walled rubber water-bags. Heavy wheel loads are thus transformed into a small uniform hydrostatic pressure on the foundation soil. The constructional problem is examined and model tests are described.

1659. Airport Approach, Runway and Taxiway Lighting Systems, by C. Edward Walter and Vincent J. Roggeveen. (AT) This paper describes various systems of approach, threshold, runway, and taxiway lights. These are evaluated by means of a set of design criteria developed from a series of principles of guidance needed by an aircraft pilot.

1660. Regulation of Lake Ontario, by Franklin F. Snyder and Robert H. Clark. (HY)

The physical characteristics of the Great Lakes, the hydrology of Lake Ontario, and regulation studies of the Great Lakes during the past half century are outlined. Latest international studies for regulation of Lake Ontario are described.

1661. Northeastern Floods of 1955: Meteorology of the Floods, by Charles S. Gilman and Kendall R. Peterson. (HY) This paper, one of three of a symposium, examines physical reasons for occurrence of the rainfall. Part of the explanation is the connection between rain-producing and energy-producing processes; another is the inertia of the winds. A series of maps is presented which illustrates these processes.

1662. Northeastern Floods of 1955: Rainfall and Runoff, by Tate Dalrymple. (HY) This second paper in the symposium lists peak discharges for selected gaging stations, and a comparison is made with the rainfall causing them. A comparison is also made with past floods and some indication of the frequency of the floods is presented.

1663. Northeastern Floods of 1955: Flood Control Hydrology, by Elliot F. Childs. (HY) This third paper describes the meteorology, flood discharges, and the effect of these events on hydrologic design criteria for flood control structures.

1664. Skin Friction Experiments on Rough Walls, by G. M. Sanks. (HY) Rough, flat plate skin friction at high Reynolds numbers is shown to be determinable from experiments at moderate Reynolds numbers in an identically roughened pipe. The effect of peripheral wires on skin friction in a pipe is correlated with the measured drag of a circular cylinder on a plane wall.

1665. Sewage Pumping, by H. H. Benjes. (SA) This paper describes pumping equipment, including types of pumps, and illustrates standard terms used in specifying pump characteristics and mechanics of pump selection.

1666. Highway Engineers and Pipeliners can Solve Mutual Problems, by C. D. Richardson. (PL) The ever-increasing pipeline and highway systems in the United States have magnified the mutual construction problems of highway engineers and pipeliners. Examples demonstrate benefits available to all from mutual cooperation.

1667. Flow Equations for Natural Gas Pipelines, by R. F. Bukacek. (PL) Flow equations

used in the natural gas transmission industry are examined in relation to their application. Factors determining resistance to flow are related to the operating conditions of natural gas pipelines to show the limitations inherent in any practical flow equation.

1668. Engineering Uses of Sonne Strip Photography, by John H. Wolvin. (PL) Design features of the Sonne aerial camera are reviewed as an aid to the understanding of unique performance features. Specific examples of engineering uses are stated together with suggested flight specifications. Uses of stereo photography for determination of terrain cross sections are covered.

1669. Municipal Financing of Airports, by Rollin F. Agard. (AT) Municipal government has played an important role in the development of the aviation industry by providing a system of airports financed primarily from bond issues. Substantial sums will be needed to provide facilities for increasing air traffic. Airlines and other users must assume a greater portion of the cost of providing and operating these facilities.

1670. Underground Power Plants in Canada, by A. W. F. McQueen, C. N. Simpson, and I. W. McCaig. (PO) This paper presents factors affecting design practice in Canada and describes two large underground powerhouses at present under construction in the Province of Quebec. Reference is made to the Kemano development in British Columbia.

1671. Kenney Dam and Cheakamus Dam in British Columbia, by William G. Huber. (PO) Site and material data, design criteria, construction procedures and some performance records are presented in this paper on two zoned rockfill dams in British Columbia, one founded on rock and the second on a mud slide.

1672. Box Canyon Hydroelectric Project, by Arthur P. Geiss. (PO) Design and construction of the main spillway dam of the Box Canyon Project is described in this paper, together with other project features including the powerhouse, diversion tunnel, forebay channel, and auxiliary spillway.

1673. Pipeline Field Welding and Quality Control Methods, by A. G. Barkow. (PL) History of pipeline-laying in the United States is traced, with emphasis on the application of weld-

ing. Welding technique, specialized equipment associated with welding, qualification procedures, and non-destructive test methods are examined.

1674. Future Prospects for International Pipelines, by William R. Connole. (PL) Although international pipelines are now physically possible, considerations of national self-interest must be settled first. A re-examination and clear statement of policy by both Canada and the United States must precede random expansion of international pipelines.

1675. Underground Power Plants in Scotland, by C. M. Roberts. (PO) The development, layout and construction of the Ceannacoe and Glenmoriston underground power plants in Northern Scotland is described. Tunneling methods, access and ventilation, surge arrangements, migratory fish and flood control provisions are examined.

1676. Civil Engineering Features of Linden Generating Station, by A. Verduin. (PO) The paper illustrates the civil engineer's role in the design and construction of a major steam electric generating station. This station is unique because of the interchange of extraction steam for refining residuals with a nearby oil refinery.

1677. SED Research Report No. 18: Municipal Incinerator Design, A Survey of Engineering Practice. (SA) This paper presents a survey of 110 cities in the United States using incinerators. Evaluation of construction trends and costs are presented along with design data and operation information.

1678. SED Research Report No. 19: Sewage Treatment by Lagoons. (SA) This report covers the economy and space involved in this method of treatment. Data and information are presented on installations and design criteria.

1679. Sewage Effluent Used for Industrial Water, by Thomas F. Sullivan. (SA) The paper describes the water and sewage effluent available and means used to overcome undesirable constituents to produce a water capable of performing the task assigned to it.

1680. Organization of Metropolitan Districts, by Langdon Pearse. (SA) Examples of

cooperative action by municipalities are the New York Port Authority and The Metropolitan Sanitary District of Greater Chicago. Data are given on such organizations in the United States and Canada, including interstate pollution control agreements.

1681. Effects of Aeration Period on Modified Aeration, by Wilbur N. Torpey and Martin Lang. (SA) Five years of operating data are analyzed to find the effect of the aeration period on process efficiency and air consumption. A region of operation from zero aeration period to the minimum necessary for full process efficiency is defined.

1682. Design of Water Supply Structures, by Howard J. Carlock. (SA) The paper is a resume of seven subjects related to water supply and representing ideas that engineers are continually developing to further improvements in design.

1683. Performance and Maintenance of Dix River Dam, by Lewis A. Schmidt, Jr. (PO) Constructed to a height of 275 feet in 1923-25, Dix Dam was then the highest rockfill dam built. Accumulated data on leakage, maintenance, condition and settlement are presented for applicable consideration in the design of future projects similar to the Dix River Dam.

1684. The Turbulent Boundary Layer in a Conical Diffuser, by Harvey R. Fraser. (HY) A method for turbulent boundary layer calculations in a smooth walled conical diffuser is proposed, based on the analysis of the boundary layer in two distinct regions and involving only the solution of algebraic equations.

1685. Salaries of Local Environmental Health Personnel in 1956, Report of the Committee on Salaries. (SA) This report is the second in the series covering the salary status of the environmental health personnel in 1956.

1686. A Study of Sewage Collection and Disposal in Fringe Areas: Second Progress Report of the Committee on Public Health Activities. (SA) In this Second Progress Report, the Committee presents Appendices B, C, D, and E to supplement the First Progress Report published as Proceedings Paper 1613 in the April, 1958 Journal of the Sanitary Engineering Division.

1687. Cogswell and San Gabriel Rockfill Dams, by Paul Baumann. (PO) Features of interest attending the design, construction and performance of two rockfill dams are treated in this paper. Attention is paid to such novel features in the design and construction as have proved to be advantageous and successful.

1688. Discussion of Proceedings Paper 1408, 1461, 1463, 1533. (SA) Alex N. Diachishin on 1408. C. J. Posey on 1461. J. Fleming Dias on 1463. H. E. Hudson, Jr. on 1533.

1689. Discussion of Proceedings Paper 1457, 1488, 1529, 1554, 1555. (PO) D. J. Bleifuss, F. L. Lawton, Pierre E. Danel and Jean Rueff on 1457. D. I. H. Barr on 1488. F. L. Lawton on 1529. F. L. Lawton on 1554. F. L. Lawton on 1555.

1690. Discussion of Proceedings Paper 1449, 1451, 1453, 1454, 1455, 1528. (HY) M. B. McPherson, J. W. Forster on 1449. H. C. Riggs and Manuel A. Benson on 1451. Steponas Kolupaila, Ralph W. Powell, John W. Paull, Iwao Oki on 1453. R. E. Templeton and T. E. Stelson on 1454. Madhav Manohar, Fred W. Blaisdell, W. T. Moody, Jean Rigard, M. B. McPherson, Steponas Kolupaila on 1455. Edward Silberman on 1528.

1691. Discussion of Proceedings Paper 1375, 1667. (PL) A. B. Wilder on 1375. Leon E. Brooks closure to 1375. James H. Dorrough on 1667.

July

Journals: Engineering Mechanics, Structural, Surveying and Mapping, Sanitary.

1692. Cylindrical Bending of Elastic Plates, by S. J. Medwadowski and K. S. Pister. (EM) The effect of shear deformation on strong cylindrical bending of an elastic plate under uniform transverse load is considered. The problem is solved and graphs are given, from which numerical results are obtainable. The solution is compared with the corresponding result of the classical theory.

1693. Dynamic Elasto-Plastic Response of Rigid Frames, by Frank L. DiMaggio.

(EM) Using expansions in terms of modes, the response of rigid frames to a concentrated force at the knee is determined. For two-hinged frames and a linearly decaying forcing function, two detailed numerical examples are presented. It is concluded that good approximations are obtained by considering only one elastic and one elastic-plastic mode.

1694. Design of Long Reinforced Concrete Columns, by Bengt Bromas and Ivan M. Viest. (ST) A design procedure involving the strength of a short column, the eccentricity determined from an elastic analysis and a reduction coefficient is presented. The procedure may be used either at working or at ultimate load level.

1695. Structural Dynamics in Earthquake-Resistant Design, by John A. Blume. (ST) Strengths, rigidities, and ultimate earthquake resistances of traditional and modern buildings are compared. Research using four actual earthquake records provides shear values for 16 20-story "buildings" with various damping and stiffness characteristics.

1696. Earthquake Design Criteria For Stack-Like Structures, by John E. Rinne. (ST) This paper indicated the response of uniform and tapered stacks and stack-like structures to earthquake ground motion, develops some criteria for shears and moments for design, and compares these with criteria suggested or specified by others.

1697. Highway And Bridge Surveys: Preliminary Surveys, Progress Report of the Committee on Highway and Bridge Surveys. (SU) The preliminary survey for a highway is a detailed study of one or more feasible routes, resulting in a paper location which defines the line for the subsequent location survey. Mapping methods and critical factors affecting the selection of alignment are examined.

1698. Highway and Bridge Surveys: Location Survey, Progress Report of the Committee on Highway and Bridge Surveys. (SU) The location survey fixes the proposed highway's centerline on the ground and includes the procurement of field data necessary for complete design. Procedures for transferring the paper location to the ground are described as well as the manner of securing information on critical features of the location.

1699. Surveying for Richard I. Bong Air Force Base, by Peter A. Machinis. (SU) The surveying problems in the development of the Richard I. Bong Air Force Base although numerous were not of an unprecedented nature. Advance, coordinated planning based on a combination of new and old established surveying techniques produced the desired results.

1700. Photogrammetric Developments for Highway Engineering, by R. H. Sheik. (SU) Progress made in gaining the confidence of engineers and contractors in aerial photogrammetry can be maintained by the engineer and the aerial photogrammetric contractor insisting on accuracy.

1701. Gas Transfer To and From Aqueous Solutions, by Thomas R. Camp. (SA) This paper reviews the development of recent advances in the theory of gas transfer, with an examination of various items. Emphasis is put on the need for more research on the subject.

1702. Effects of Mechanics of Flow on Corrosion, by Amilcar J. Romeo, Rolf T. Skrinde, and Rolf Eliassen. (SA) This paper presents fundamental hydraulic concepts as applied to corrosion and the rate of interacting chemicals in flow over plates, rotating disks, and through pipes.

1703. Forced Circulation of Large Bodies of Water, by Thomas M. Riddick. (SA) In 1956 a floating aerator was put in service at the Ossining, N. Y. municipal water collecting reservoir. Results included completely breaking reservoir stratification, and oxidation and precipitation of iron and manganese, among others.

1704. An Introduction to Solar Distillation, by Tim de Jong. (SA) This paper presents a study and results of experiments on the production of potable water with solar energy on three pilot plants in Iran. Effects of geographical location, size and shape of plants, and descriptions of various plants and methods of distillation on the actual production of the pilot plants are explained with charts and tables.

1705. Sanitary Engineers: The Need and the Securing, by Frank A. Butrico and Mark D. Hollis. (SA) More, better, and differently qualified sanitary engi-

neers are required. They should be attracted by a more adequate public relations campaign, and should be financially supported at the academic training levels especially in the undergraduate years.

1706. Limit Analysis of Simply Supported Circular Shell Roofs, by M. N. Fialkow. (EM) Plastic collapse of a partial circle cylindrical shell supported at each end with the longitudinal edges free is investigated for the case of uniform radial loading. The principles of limit analysis applicable to a plastic-rigid structure are utilized to develop upper and lower bounds for the collapse pressure.

1707. Wind Forces on Structures: Introduction and History, by J. M. Biggs. (ST) This paper is an introduction to a group of papers prepared by the Committee on Wind Forces of the Structural Division. The papers are Proceedings Papers 1707, 1708, 1709, 1710, 1711 and 1712.

1708. Wind Forces on Structures: Nature of the Wind, by Robert H. Sherlock. (ST) Recommendations are given for the one-minute-average wind velocity at a height of 30 feet as the basic velocity of reference in different parts of the country and for different height zones. The origin of strong winds, extra-tropical cyclones, hurricanes, and tornadoes are treated.

1709. Wind Forces on Structures: Fundamental Considerations, by Glenn B. Woodruff and John J. Kozak. (ST) This paper concerns forces on structures and structural elements caused by wind. The variables which determine magnitude of aerostatic and aerodynamic forces are examined. Pressure distribution and drag and lift coefficients for certain elementary shapes are shown.

1710. Wind Forces on Structures: Forces on Enclosed Structures, by Thomas W. Singell. (ST) This paper analyzes the work of past and present investigators and correlates data relating to shape coefficients for various building shapes. Included is a series of tables from the Swiss Building Code.

1711. Wind Forces on Structures: Plate Girders and Trusses, by W. Watters Pagon. (ST) This paper presents such

indications and conclusions as can be drawn at this time, of knowledge from available wind tunnel tests on plate girder and truss bridges, with open or closed deck, and for towers, antennae and similar structures.

1712. Wind Forces on Structures: Structures Subject to Oscillation, by F. B. Farquharson. (ST) Determination of wind forces on a structure is basically a dynamic problem. This paper is devoted to that portion of the problem involving structures which respond dynamically to the imposed wind forces.

1713. Highway and Bridge Surveys: Introduction to Bridge Surveys and Reconnaissance Survey, by Milton O. Schmidt, Chmn. (SU) The progressively longer span bridge structures now being built have made mandatory the use of accurate construction controls and use of geodetic equipment by trained personnel. Part B of the proposed manual deals with bridge surveys, and Chapter V describes the reconnaissance survey for a large bridge.

1714. Fringe Area Sewerage Problems, by John E. Kiker, Jr. (SA) The paper reviews the problems and some of the means of solving fringe area sewerage problems. The relative merits of septic tanks, package plants and oxidation ponds are considered from the standpoint of construction and operation.

1715. Design Details for Individual Sewage Disposal Systems, by Harrison A. Martin. (SA) Design procedures, simplification of design methods and comment on design of septic tank systems are presented. Some standardization is provided and methods are examined.

1716. Precise Surveys for Mackinac Bridge, by R. M. Boynton. (SU) A description is given of surveying problems involved, equipment and methods used to establish a major triangulation net on land, and vertical control across approximately four miles of water.

1717. Controlled Submergence of Pittsburgh's Deep Sewers, by J. F. Lafoon. (SA) Design features of Pittsburgh's thirty miles of tunnel sewers now under construction by the Allegheny County Sanitary Authority, and proposed procedures for operation of the system under controlled submergence are described in this paper.

1718. Effective Width of Thin Rectangular Plates, by Morris Ojalvo and Frederick H. Hull. (EM) The behavior of simply supported rectangular plates subjected to edge compression in one direction is investigated by means of load-shortening tests. The data are presented by non-dimensional curves of effective width versus average unit shortening.

1719. Bending of Elastically Supported Rectangular Plates, by Melvin Zaid and Marvin Forray. (EM) The problem of bending of a rectangular plate, elastically supported on variable rigidity beams, subjected to a transverse loading or temperature gradient is solved in this paper. Specific combinations of support are examined, and a detailed solution is given for a square plate with one edge free.

1720. Education in Surveying and Photogrammetry in Europe, by G. Gracie and H. Karara. (SU) This paper presents the formal education in surveying and photogrammetry offered in a number of western European countries. The various university undergraduate courses in surveying and photogrammetry and the graduate studies and degrees are examined.

1721. Discussion of Proceedings Papers 1023, 1302, 1304, 1440, 1510, 1519, 1567. (ST) A. W. Hendry and L. G. Jaeger closure to 1023. Stewart Mitchell and Gerald F. Borrmann closure to 1302. Carl E. Ekberg, Jr., Rene E. Walther, and R. G. Slutter closure to 1304. John M. Hayes corrections to 1440. J. J. Hromadik on 1510. W. J. Jurkovich on 1519. Harry Posner corrections to 1567. William S. Walker and Joseph T. Kolibal on 1567.

1722. Analysis of Finite Beams on Elastic Foundation, by Denos C. Gazis. (ST) The analysis of bending of finite beams on elastic foundation, under the action of an arbitrary distribution of lateral loads, is accomplished by an iterative procedure analogous to the Hardy Cross method for the analysis of continuous beams and structural frames.

1723. The Behavior of One-Story Brick Shear Walls, by Jack R. Benjamin and Harry A. Williams. (ST) This paper gives the results of an investigation of the effectiveness of unreinforced brick masonry walls to resist shear forces applied in the plane of the wall. Some approxi-

mate relationships are suggested as a means of predicting the behavior of such walls.

1724. Discussion of Proceedings Papers 1604. (EM) A. Hrennikoff corrections to 1604.

AUGUST

Journals: Hydraulics, Power, Soil Mechanics and Foundations.

1725. Outlet Structures for Fixed-Dispersion Cone Valves, by Maurice L. Dickinson, Stanley M. Barnes and Robert S. Milmo. (HY) Outlet structures housing fixed-dispersion cone valves at three locations with varying requirements for protection against freezing, energy dissipation, and dependable remote control with close regulation of discharge are described. Results of model and prototype tests are given.

1726. Hurricane Protection Planning in New England, by John B. McAleer and George E. Townsend. (HY) Hurricane Carol of August, 1954, triggered authorization of a hurricane survey of the Atlantic and Gulf Coasts. This paper describes the basic data and engineering methods used in the New England area.

1727. Predicting Seepage Under Dams on Multi-Layered Foundations, by Paul H. Shea and Harry E. Whitsett. (SM) This paper presents methods developed for predicting rates of seepage under dams and levees on multi-layered foundations. A description of the pump-

ing test procedure used to implement those methods is included.

1728. Design and Performance of Vermillion Dam, by K. Terzaghi and T. M. Leps. (SM) Design and performance of a zoned earth dam on marginal glacial deposits is described. The deposits were so intricately stratified that determination of essential geological features had to be deferred until the construction period.

1729. Procedure for Rapid Consolidation Test, by Hsuan-Loh Su. (SM) A method for the consolidation test is given with precision of results comparable to that from a conventional test.

1730. Effects of Ground on Destructiveness of Large Earthquakes, by C. Martin Duke. (SM) Knowledge of the relation between ground conditions and earthquake damage to structures is presented in terms of observations of destructive earthquakes. Thirty-six earthquakes are cited for which a relation has been reported.

1731. Pressure Grouting Fine Fissures, by Thomas B. Kennedy. (SM) Fine horizontal cracks between concrete slabs were grouted in a laboratory study. It was found that certain materials, when added to grouts, greatly reduced their solubility.

1732. Geotechnical Properties of Glacial Lake Clays, by T. H. Wu. (SM) This paper describes properties of glacial lake clays. Data collected from the Great Lakes are presented. The investigation consists of an evaluation of the stress history and structure of the clay deposits.

1733. Rockfill Dams: Cherry Valley Central Core Dam, by H. E. Lloyd. O. L. Moore and W. F. Getts. (PO) Construction and performance of the Cherry Valley Dam of the Hetch Hetchy Water Supply of the City and County of San Francisco is described. Measurements of the settlements and deflections are given.

1734. Rockfill Dams: Brownlee Sloping Core Dam, by Torald Mundal. (PO) This paper describes the design and construction of the rock-fill dam portion of Brownlee Hydroelectric Project, including diversion of flood waters over the partially completed embankment, and construction of the embankment on 110 feet of river-deposited materials.

1735. Rockfill Dams: Kajakai Central Core Dam, Afghanistan, by Glenn F. Sudman. (PO) This paper examines the design and construction of the rockfill dam embankment portion of Kajakai Project, that required maximum use of locally obtainable materials and training of a native work force.

1736. Rockfill Dams: Performance of TVA Central Core Dams, by George K. Leonard and Oliver H. Raine. (PO) Presented is a comparison between design assumptions that may influence that design of rockfill dams. Three TVA rockfill dams are considered in this light.

1737. Rockfill Dams: Salt Springs and Lower Bear River Concrete Face Dams, by I. C. Steel and J. B. Cooke. (PO) The 28-year service record of Salt Springs Dam is presented. The design, construction and performance of the two Lower Bear River Dams is presented and compared to that of Salt Springs Dam.

1738. Rockfill Dams: The Dalles Closure Dam, by Robert J. Pope. (PO)

The problem of a closure dam for the Dalles project in 180-foot depth of water was solved by the design and construction of a rockfill structure, two-thirds of which was built under water.

1739. Rockfill Dams: Review and Statistics, by John B. Snethlage, F. W. Scheidenhelm and Arthur N. Vanderlip. (PO) The paper reviews present practices on rockfill dams and develops a definition, classification and terminology for such dams and for those using earth in addition to rock fill. Advantages of deck-type dams and settlement and economy of rockfill dams are examined.

1740. Rockfill Dams: The Bersimis Sloping Core Dams, by F. W. Patterson and D. H. MacDonald. (PO) The Bersimis No. 1 hydroelectric power development in Canada involved the construction of two earthfill dams and two rockfill dams. This paper describes the site, design, construction, and performance of these dams.

1741. Rockfill Dams: The Derbendi Khan Dam, by Calvin V. Davis. (PO) Problems in designing a central core rockfill dam in Iraq are described. A field exploration and materials testing program provided a sound basis for the selection and design of the dam.

1742. Rockfill Dams: Nantahala Sloping Core Dams, by James P. Growdon. (PO) Design of a 250-foot high sloping core rockfill dam was determined to facilitate construction with materials readily available. This paper describes the site and examines construction procedures and performance.

1743. Rockfill Dams: Dams With Sloping Earth Cores, by James P. Growdon. (PO) This paper reviews the principles which govern the design of a rockfill dam and examines six rockfill dams.

1744. Rockfill Dams: Performance of Seven Sloping Core Dams, by James P. Crowdon. (PO) Design and construction of seven dams is briefly reviewed. Performance, measured in terms of leakage, repairs and maintenance is presented.

1745. Rockfill Dams: Performance of Mud Mountain Dam, by Allen S. Cary. (PO) Mud Mountain Dam, an earth and rockfill structure 400 feet high, has settled in the core zone as predicted during design studies based on large scale consolidation tests. Results of settlement are given.

1746. Rockfill Dams: Wishon and Courtright Concrete Face Dams, by Barry Cooke. (PO) Design and construction of two approximately 300-foot high dams are discussed. Changes in design and construction from previous P. G. and E. dams have been made to lower the cost without affecting safety.

1747. Rockfill Dams: The Paradela Concrete Face Dam, by Luis Henrique Gomes Fernandes, Edgard de Oliveira and Nuno de Vasconcelas Porto. (PO) The 361-foot high dam forms part of the hydro-power development of orthern Portugal. The paper discusses the selection of site, type of dam, procedure, design and construction details. Performance data is given.

1748. Rockfill Dams: The Paradela Dam—Foundation Treatment, by Walter J. Weyermann. (PO) Foundation conditions at the site of the Paradela Dam in

Portugal and the various problems presented are described. This paper examines the arrangement of grout curtains and presents performance data on seepage control.

1749. Rockfill Dams: Design of Cougar Central Core Dam, by Paul Thurber. (PO) A central-core section was decided for Cougar Dam. The susceptibility of a sloping core of compacted earth to rupture from the type of settlement that would occur helped in making the choice.

September

Journals: Irrigation and Drainage, Structural, Waterways and Harbors, Sanitary.

1750. Potential Use of Water by Irrigation in the Humid Areas, by Keith H. Beauchamp. (IR) This paper examines the problems of increasing irrigation water demands. Aspects of humid area irrigation offsetting uneven rainfall distribution and stabilizing production and income are presented.

1751. Worldwide View of Irrigation Developments, by N. D. Gulhati. (IR) The development of water resources to provide irrigation facilities, improve existing agriculture, and to reclaim large areas of desert or otherwise barren lands are presented.

1752. Multiple-Use Projects in Development of Water Resources, by W. A. Dexheimer. (IR) Doubling the United States present water supply by 1975 requires cooperative and multiple-purpose planning. River-basin construction should be coordinated by local, state, and federal agencies.

1753. State Versus Federal Control of Western Waters, by Lewis A. Stanley. (IR) Examined in this paper is the Supreme Court decision in the Pelton Dam case as it affects the sovereignty of the western states in the control of non-navigable waters within their borders.

1754. Water—A Limiting Resource? by Robert O. Thomas. (IR) This paper emphasizes the magnitude of the anticipated demand for water in the United States. The availability of water is compared with the major demands made upon the supply.

1755. Thermal Considerations in the Design of Concrete Shields, by Harold S. Davis. (ST) Behavior and properties of concrete structures for shielding atomic power plants are presented, with methods for estimating thermal effects associated with linear and non-linear distribution of temperature, nuclear heating, and shield cooling.

1756. An Analytical and Experimental Study of Helicoidal Girders, by Y. F. Young and A. C. Scordelis. (ST) A study of the helicoidal girder, fixed at the ends, subtending a horizontal angle of 180° , and having a slope of 30° is presented.

1757. Practical Aspects of Ultimate Strength Design, by Alfred L. Parme. (ST) Time-saving design charts for the rapid selection of the critical load factor combination are presented. Loads and area of reinforcement obtained by ultimate strength design procedure are compared with those obtained by conventional methods.

1758. Numerical Analysis of Two-Hinged Arches, by Thomas D. Y. Fok and Tung Au. (ST) This paper presents a numerical solution for the influence ordinates of the horizontal reaction in a two-hinged arch of variable section.

1759. High-Speed Computer Applied to Bridge Impact, by Charles T. G. Looney. (ST) Results of a study of the impact on highway bridges is described. The effect of different bridge and truck characteristics are presented, and also a dimensionless representation of all the variables.

1760. Causes of Deterioration and Protection Methods: Progress Report of a Sub-Committee of the Committee on Timber Structures. (ST) The causes of deterioration of wood and the conditions under which damages result are described. General methods in use for protection of timber structures are given.

1761. Analysis of Rigid Frames by Successive Replacement, by Chen Loh-Kwan and Li Seung Ping. (ST) An analytical method is developed for the calculation of moments at the supports or joints of rigid frames by replacing

a portion of a structure with a member of its equivalent in stiffness or in rigidity.

1762. Analysis of Continuous Beams by Carry-Over Moments, by Jan J. Tuma. (ST) A general method for the analysis of continuous beams of constant or variable depth is presented and tables are given.

1763. General Considerations for Reactors and Related Plant Types, by John F. Stolz. (ST) This paper classifies reactors according to their purpose and examines those reactor plants designed for power generation.

1764. Analysis of Frames with Curved and Bent Members, by Jan J. Tuma, Kerry S. Hanner and Frank Hedges. (ST) The application of a modified moment distribution method to the analysis of continuous and complex frames with curved and bent members is presented.

1765. Laboratory Studies of Wind Waves in Shallow Water, by John C. Hufft. (WW) This paper presents the results of a laboratory investigation of the growth of wind waves in relatively shallow water, including experimental relationships between velocity, fetch, and wave parameters for two different water depths.

1766. Irrawaddy River System of Burma, by Henry R. Norman. (WW) This paper examines transportation conditions of the Irrawaddy River system of Burma up to 1953, including the pre-war, wartime, and the post-war system.

1767. Model Studies of Sector Gate Type Locks, by Frederick R. Brown. (WW) Sector gate type locks may be used to advantage where reverse head conditions are encountered or where it is desirable to operate the gates under head for passage of debris or ice. Results of model tests are given.

1768. The Port of Chicago, by Austin E. Brant, Jr. (WW) This paper presents the results of a detailed economic and engineering study of the port of Chicago and the effects on the Port of the St. Lawrence Seaway.

1769. Changing Site Requirements for Port Operation, by Peter Engelmann. (WW) Changes in cargo handling methods at modern ports are analyzed, concluding that, for maximum future operating efficiency, dock-side transit areas should be greatly enlarged.

1770. The Suez Canal—Its Chronicle and Bibliography, by Shu-t'ien Li. (WW) The chronicle of development and engineering events of the Suez Canal beginning 4,000 years ago to 1956, and a bibliography of all published works from 1800 to 1957 are presented.

1771. The American Locks of the St. Lawrence Seaway, by John P. Davis. (WW) Design and construction of the Eisenhower and Grass River locks of the St. Lawrence Seaway are described, and the necessity for and design of certain measures required for damage control is stressed.

1772. Scientific Developments in River Transportation, by C. R. Horton, Jr. (WW) The paper describes progress made in model testing of push-type river towboats and barge fleets. Progress in improving efficiency of river towboats by the new model techniques is evaluated in terms of performance and economics.

1773. Hydraulic Design of Columbia River Basin Navigation Locks, by G. C. Richardson and N. J. Webster. (WW) This paper presents design aspects of the hydraulic systems of the Columbia River Basin's lift navigation locks.

1774. Land Subsidence due to Ground-Water Development, by J. F. Poland. (IR) Land subsidence has occurred in several areas of intensive ground-water development in California. This paper examines the subsidence areas, and summarizes the principal problems that have developed.

1775. The Engineer and Worldwide Conservation of Soil and Water, by Orson W. Israelsen. (IR) The role of the engineer in worldwide soil and water conservation is emphasized. A report on drainage systems and irrigation projects is presented.

1776. Simplified Techniques in Air Pollution Measurement, by E. R. Hendrickson. (SA) Reviewed are several applications of simplified techniques in air pollution measurements and the needs involved in setting up an air pollution sampling program.

1777. Proposed Changes in Eastern Water Use Policies, by Murray Stein. (SA) This paper considers and compares changing uses of water in the east with western state uses. Consideration is given to the work to be done on a "Model Water Use Act."

1778. Design of Chicago's Central Filtration Plant, by Fred G. Gordon. (SA) This paper consists of a general review of the design features of the Central District Filtration Plant of Chicago.

1779. SED Research Report No. 20: Bottom Deposits in a River and their Potential Effects on Dissolved Oxygen Concentration. (SA) The effect of organic bottom deposits indicates reduction of dissolved oxygen concentration in flowing water. The paper uses a part of the Connecticut River to demonstrate the importance of evaluating bottom deposits in studying pollution.

1780. Resistance of Sewage Sludge to Flow in Pipes, by Tsung-Lien Chou. (SA) Flow of sewage sludge in pipes is classified into four categories of different characteristics and criterion and practical formulas are developed.

1781. The Beauharnois Canal Locks, by Duncan McIntyre. (WW) The Beauharnois locks on the St. Lawrence Seaway are described. The selection of the locking arrangements are presented, along with construction features of the locks.

1782. Planning the Future for Chicago's Water System, by W. W. De Berard. (SA) In 1953 the operating functions of the Chicago water system were placed under the Bureau of Water. Chicago is now eliminating possibilities of water shortages, and arrangements are being made to furnish water from the Lake Michigan source to suburban communities.

1783. Capacity Criteria for Refuse Incineration, by Samuel M. Clarke. (SA) Changes in accepted methods of stating refuse incinerating capacities are proposed to distinguish plant capacity from furnace capacity. The importance of the class of refuse to be burned is stressed, and design criteria, based on BYU loadings are suggested.

1784. Discussion of Proceedings Paper 1352, 1360, 1362, 1363, 1364, 1497, 1501, 1507, 1589, 1591. (IR) E. A. Kimbrough, Jr., closure to 1352. Isidro D. Carino closure to 1360. Charles W. Thomas closure to 1362. Clyde P. Cass, Jr., and Richard T. Shen on 1363. Louis W. Herndon closure to 1363. Frederick L. Hotes on 1364. Ray L. Derby closure to 1364. Alfred R. Golze on 1497. J. Ernest Flack on 1501. Harry F. Blaney on 1507. Frederick L. Hotes on 1589. Frederick L. Hotes on 1591.

1785. Discussion of Proceedings Paper 1366, 1569, 1644. (WW) E. M. Cummings closure to 1366. John B. Herbieh on 1569. Robert E. Hickson on 1644.

1786. Discussion of Proceedings Paper 1534, 1608. (SA) Charles H. Lawrance and David R. Miller, D. I. H. Barr on 1534. M. R. McPherson and J. V. Radziul on 1608.

1787. Discussion of Proceedings Paper 1303, 1318, 1357, 1431, 1434, 1510, 1519, 1561, 1562, 1563, 1567, 1633, 1637, 1711. (ST) A. M. Lount closure to 1303. Leroy T. Oehler closure to 1318. Frank Baron closure to 1357. Nan-Sze Sih closure to 1431. Richard Z. Zimmermann closure to 1434. T. Jumikis and A. S. Hall on 1510. Charles D. Susman on 1519. Marvin A. Larson, Giles G. Green, Bruce G. Johnston, A. Chibaro on 1561. Alexander Dodge, Lyman C. Reese on 1562. A. A. Eremin on 1563. A. A. Eremin on 1567. Fritz Leonhardt on 1633. W. H. O'Brien on 1637. Corrections to 1711.

1788. The Importance of Hydraulics of Surface Irrigation, by Vaughn E. Hansen. (IR) Hydraulic elements involved in surface irrigation are listed and examined. Relating these hydraulic elements is the key to efficient irrigation, good design, and a permanent agriculture.

1789. Navigation on the Columbia River, by Ray E. Holmes. (WW) This paper presents the historical development of navigation of the Columbia River, including a description of navigational structures, maintenance procedures, past and present, and an examination of possible trends.

October

Journals: Structural, Hydraulics, Soil Mechanics and Foundations, Engineering Mechanics, Highway, Power.

1790. Minimum Weight of Frames Under Shakedown Loading, by Jacques Heyman. (EM) This paper examines the minimum weight design of framed structures under both fixed and independently varying loads. A numerical example is given, for which the solution is obtained, and the results corresponding to the two types of loading are compared.

1791. Effect of End-Fixity on the Vibration of Rods, by D. Burgreen. (EM) A study is made of the free vibration of rods with end supports of equal elasticity. Expressions are derived relating the end-fixity to frequency and mode of vibration. With the proper type of negative springs attached to the ends of the rod, it is shown that vibrations can be suppressed.

1792. Eccentrically-Loaded, Hinged Steel Columns, by R. E. Mason, G. P. Fisher and Geo. Winter. (EM) Tests are reported on thirty eccentrically and concentrically loaded steel columns. Failure loads are compared with predictions by the secant formula and other current methods.

1793. Approximate Buckling Loads of Open Columns, by Yu-kweng M. Lin. (EM) A general equation applicable to any boundary conditions for coupled buckling of thin-walled open columns is presented. It is found that a most general problem of triple coupling may be solved approximately as two double coupling cases.

1794. Dynamic Effect of a Moving Load on a Rigid Frame, by R. C. De Hart. (EM) The dynamic effect of a distributed load moving with constant velocity across a rigid frame is described in this paper. It is demonstrated that a single impact factor is not applicable to all parts of the frame.

1795. The Research Phase of the AASHO Road Test, by W. N. Carey, Jr. (HW) In this report the principles underlying the experiment design for the AASHO Road Test are examined along with the basic analyses that will be performed. The principal dependent variable is defined and the independent design variables are listed.

1796. The History of Road Tests, by E. A. Finney. (HW) This report traces the construction of different types of road tests in the United States from the latter part of the 18th century to the AASHO Road Test now under construction in the State of Illinois.

1797. Creating a Better Understanding of Traffic Engineering, by Donald M. McNeil. (HW) The increasing use of private motor vehicles has necessitated the specialization known as Traffic Engineering. This phase of engineering deals with the planning of streets, highways, abutting lands, and with traffic operation thereon.

1798. The AASHO Road Test, by W. B. McKendrick, Jr. (HW) The AASHO Road Test at Ottawa, Illinois is sponsored by the American Association of State Highway Officials. This paper outlines objectives and purposes, administrative procedures, financing, and progress of the construction of the test facility.

1799. Reinforcement in Continuous Concrete Pavements, by Vedat A. Yerlici. (HW) An analytical approach to a national design method is presented for the reinforcing steel in continuous concrete highway pavements. Formulas are derived, giving needed steel area and perimeter to insure against widening of cracks in the slab.

1800. Tests of Concrete Pavements on Gravel Subbases, by L. D. Childs and J. W. Kapernick. (HW) This paper examines the effect of subbase thickness on pavement performance, concluding that a greater load capacity can be achieved by thickening the concrete rather than by building deep subbases.

1801. Urban Transportation Problem: Progress Report of the Committee on Urban Transportation of the Highway Division. (HW) Cities must achieve a rational balance between essential modes of transportation, and the modern urban complex demands an areawide approach to the problem. Transportation planning must be more closely integrated with economic, sociological and political factors.

1802. Needs Studies on a Continuing Basis, by R. E. Livingston. (HW) This paper outlines the necessity for a standard procedure for preparing cost estimates used in needs studies of highway systems. It considers elements of the estimate and the work items comprising them.

1803. Comprehensive Transportation Planning, by R. I. Creighton. (HW) Systematic methods are described for analyzing data and preparing and testing plans for all types of transportation facilities in urban areas, based on forecasts of traffic as generated by future land uses.

1804. Need of the Interstate System of Highways, by G. M. Williams. (HW) Provisions of the Federal-Aid Highway Acts from 1916 through 1956, the actions leading to establishment of the Interstate System of Highways in 1944, and the plans for accelerating the rate of construction are reviewed.

1805. The Federal Highway Program in New York State, by John W. Johnson. (HW) This paper examines the efforts of the federal and state governments in the building of the nation's highways from 1916 to the present day. A synopsis is developed of New York State's multi-billion dollar construction program with illustrative comments on area alignments.

1806. Sedimentation Studies in the Western Gulf States, by Graham W. Benfro and Charlie M. Moore. (HY) A summary of the more important reservoir sedimentation surveys made by the Soil Conservation Service in the area is presented. Methods used in determining sediment

yields are described. The effect of watershed protection measures, including floodwater retarding structures in reducing sediment yield from watershed is examined.

1807. Some Experiments with Emergency Siphon Spillways, by Warren B. McBirney. (HY) Two model designs of low head siphon spillways were tested. Operational characteristics and peculiarities of the two siphon designs are discussed and supporting data and pictures are included.

1808. Synthetic Flood Frequency, by Franklin F. Snyder. (HY) A procedure is developed for computing the flood discharge probability associated with a given rainfall-duration-frequency pattern on natural drainage basins, non-channelized overland flow areas and areas with storm sewer drainage.

1809. Divining Rods Versus Hydrologic Data and Research, by W. B. Langbein. (HY) The divining rod as a mystical hydrologic decision-maker is contrasted with modern basic-data programs. The extent and kinds of gaps in basic data are discussed with emphasis on deficiencies in research and interpretation.

1810. Numerical Solution of Flow Problems in Rivers, by E. Isaacson, J. J. Stoker and A. Troesch. (HY) New methods for dealing with flow problems in large rivers and reservoirs for lengthy periods of time are developed. The simplicity and flexibility of the methods are explained.

1811. Queuing Theory and Water Storage, by W. B. Langbein. (HY) A method for determining the amount of holdover storage for regulating streamflow is presented based on analogies with queues. Where discharge varies linearly with reservoir contents a unique expression is derived. The queuing analogy leads to a general solution by "probability routing."

1812. Analysis for Partially Penetrating Sand Drains, by E. G. Hart, R. L. Kondner, and W. C. Boyer. (SM) A numerical procedure of analysis for partially penetrating sand drains has been developed. Possible simplified methods of analysis are indicated and laboratory tests have been conducted to correlate these methods with observed rates of consolidation.

1813. Grouting Deep Solution Channels Under an Earth Fill Dam, by Leland F. Grant and Lewis A. Schmidt. (SM) Deep limestone solution channels caused leakage under an elliptical earth fill dam which forms a pond for log storage at Bowaters Southern Paper Corporation's newsprint mill at Calhoun, Tennessee. The foundation was stabilized by grouting and leakage was eliminated successfully.

1814. Digital Computation for Stiffness Matrix Analysis, by J. S. Archer. (ST) A matrix

method is described for the static stress and normal mode analysis of highly indeterminate structures on large scale digital computers. This method is applied to the analysis of basic types of civil engineering structures.

1815. Numerical Solutions for Interconnected Bridge Girders, by Heary Malter. (ST) Two numerical methods for the solution of the problem of interconnected bridge girders are considered for the particular case involving infinite torsional rigidity of the main longitudinal members for two-girder and four-girder structures.

1816. Generalization of the Successive Approximations Method, by Panagiotis D. Moliotis. (ST) This paper presents the theory and the methods of analysis of rigid frames whose joints are not points but are considered as small undeformed areas. These frames are analyzed by the method of successive approximations and examples are presented.

1817. Golden Gate Bridge Vibration Studies, by George S. Vincent. (ST) Presented are the results of observations of the movements of the Golden Gate Bridge. Correlations with theoretical calculations of wave forms and wind tunnel tests indications of the behavior to be expected of the bridge are made.

1818. Concrete Beams and Columns With Bundled Reinforcement, by N. W. Hanson and Hans Reiffersahl. (ST) Tests of pairs of large beams with conventionally spaced and with bundled longitudinal reinforcement are reported. No significant difference in behavior or strength was found for bundled as compared to spaced reinforcement.

1819. Matrix Formulation of Slope-Deflection Equations, by Chu-Kia Wang. (ST) A simple and systematic way is outlined so that slope-deflection equations may be put in matrix form. This method will expedite the exact analysis of many complex rigid frames under many loading conditions, including sideways.

1820. Deflection of Variable Stiffness Members, by D. G. Fertis and E. C. Zobel. (ST) This paper determines deflection of members with variable stiffness by selecting a reference value and by replacing a member with an equivalent system having a uniform stiffness.

1821. Amplification of Stress and Displacement in Guyed Towers, by Robert S. Rowe. (ST) Problems dealing with the amplification of stress and displacement in guyed towers when changes in geometry are included in the analysis are presented. A simplified method for determining the slack stress in the guy and horizontal displacements due to wind load are also considered.

1822. Large Deflection of Elasto-Plastic Plates Under Uniform Pressure, by Thein Wah. (EM) The differential equation for the deflection of an infinitely long plate is well known. In this paper the analysis is carried into the plastic range for the case of uniform and clamped edges.

1823. The Pelton Hydro-Electric Development, by J. M. Mullarkey. (PO) A description of the project, of the design of the dam and spillway, and of the construction plant and progress is given in this paper.

1824. Computation of the Stability of Slopes, by Otto H. Meyer. (SM) This paper develops analytical formulas for the solution of problems involving the stability of earth slopes and embankments, and included graphs making it possible to solve these problems with a minimum of computations.

1825. Consolidated C.B.R. Criteria, by R. G. Ahlvin. (SM) Flexible pavement design criteria as used by the Corps of Engineers are reduced to a single plot and compared with all available service-behavior-type data. The data, which include test section and documented in-service results, are tabulated.

1826. Progress Report on Glossary of Terms and Definitions in Soil Mechanics. (SM) This report, prepared by the ASCE Committee on Glossary of Terms and Definitions in Soil Mechanics presents a compilation of terms, definitions and symbols currently in use in soil mechanics literature.

1827. Discussion of Proceedings Paper 1436, 1437, 1509, 1560, 1562, 1633. (ST) Per Hall, Troels Brøndum-Nielsen and H. R. Kivisild closure to 1436. Alan M. C. Holmes closure to 1437. Juergen Plaehn on 1509. Corrections to 1509. I. M. Nelidov on 1560. Victor R. Bergman and N. J. Ryker, Jr. on 1562. A. Kabaila on 1633.

1828. Discussion of Proceedings Paper 1309, 1427, 1428, 1429, 1535, 1537, 1545, 1546, 1547, 1548, 1549, 1550, 1552, 1654, 1655. (SM) R. W. Johnson closure to 1309. H. B. Seed and C. K. Chan closure to 1427. K. S. Bawa closure to 1428. Gunnar M. Brune closure to 1429. Lyndon C. Reese and Hudson Matlock, John A. Focht on 1535. D. C. Pearce corrections to discussion 1657. Bruce E. Clark on 1545. Bruce E. Clark on 1546. Bruce E. Clark on 1547. Bruce E. Clark and L. A. Schmidt, Jr. on 1548. Bruce E. Clark on 1549. Bruce E. Clark on 1550. L. A. Schmidt, Jr. on 1552. B. P. Warkentin and R. N. Y. Yong and G. A. Leonards on 1654. Alfred C. Scheer, R. N. Y. Yong and P. B. Warkentin on 1655.

1829. Discussion of Proceedings Paper 1372, 1374, 1626, 1627. (HW) Alfred C. Scheer closure to 1372. Joseph Barnett closure to 1374.

Wilson Davis and Lewis H. Tuthill on 1626. Stephen G. Petersen on 1627.

1830. Discussion of Proceedings Paper 1330, 1398, 1414, 1420, 1488, 1598. (PO) J. Barry Cooke and Arthur G. Strassburger closure to 1330. E. L. Seeland closure to 1398. Howard A. Preston, and Louis E. Rydell closure to 1414. Sylvan J. Skinner closure to 1420. R. T. Richards closure to 1488. F. C. Rodriguez, Stavros N. Nicolaou on 1598.

1831. Discussion of Proceedings Paper 1390, 1399, 1496, 1596, 1604, 1706. (EM) H. M. Nelson, D. T. Wright and J. W. Dolphin closure to 1390. Seng-Lip Lee closure to 1399. Corrections to 1496. Corrections to 1596. Keith Jones on 1604. Corrections to 1706.

1832. Discussions of Proceedings Papers 1197, 1201, 1260, 1264, 1266, 1331, 1345, 1393, 1395, 1401, 1402, 1403, 1405, 1401-1406, 1401 and 1405, 1406. (HY) John L. Bogardi on 1197. Closure to 1197. W. G. Whippen and G. D. Johnson closure to 1201. Ahmed Shukry closure to 1260. R. H. Berryhill closure to 1264. M. B. McPherson and M. H. Karr closure to 1266. Walter C. Carey and M. Dean Keller closure to 1331. P. K. Kandaswamy and Hunter Rouse closure to 1345. F. Paderi on 1345. J. M. Robertson and G. L. Cahuff closure to 1393. E. Kuiper closure to 1395. J. N. Bradley and A. J. Peterka closure to 1401. J. N. Bradley and A. J. Peterka closure to 1402. J. N. Bradley and A. J. Peterka closure to 1403. J. N. Bradley and A. J. Peterka closure to 1406. J. N. Bradley and A. J. Peterka closure to 1401-1406. Corrections to discussion to 1616. J. N. Bradley and A. J. Peterka closure to 1401 and 1405.

NOVEMBER

JOURNALS: Hydraulics, Sanitary Engineering, Structural, Surveying and Mapping.

1833. WAVE FORCES ON SUBMERGED STRUCTURES, BY ERNEST F. BRATER, JOHN S. MCNOWN AND LESLIE D. STAIR. (HY) The magnitude and characteristics of forces resulting from oscillatory waves were determined for models of submerged barge-like structures.

1834. SNOWMELT RUNOFF, BY J. HAROLD ZOLLER AND ARNO T. LENZ. (HY) Factors relating to the melting of snow were evaluated for

the snowmelt periods of 1938 through 1952 for the Big Eau Pleine River in Wisconsin. Convection and condensation melt potentials were computed from equations developed by previous investigations.

1835. HYDROLOGICAL ASPECTS OF RADIOACTIVE WASTE DISPOSAL, BY WILLIAM H. BIERSENK. (SA) Geologic and hydrologic data have made it possible to predict the behavior of low-level radioactive wastes. At no time in the plant's history has the underground movement of radioactive wastes resulted in detectable amounts reaching points of public access.

1836. BLAST PHENOMENA FROM A NUCLEAR BURST, BY FERD. E. ANDERSON, JR. (ST) This paper describes the air blast and ground shock free field phenomena associated with a nuclear burst. The data presented extend that presented in the publication, "The Effects of Nuclear Weapons."

1837. BLAST LOADING STRUCTURES, BY H. L. MURPHY. (ST) An examination of blast loading on structures is presented in terms of nuclear blast phenomena and is related to closed rectangular structures located above ground, semi-buried, and underground.

1838. THE FACTOR OF SAFETY IN DESIGN OF TIMBER STRUCTURES, BY LYMAN W. WOOD. (ST) Reduction in the average strength of clear wood is made necessary by the conditions of structural use. A way to estimate safety is to use near minimum values for these conversion factors and make a further reduction for unforeseen conditions.

1839. LIGHT WOOD TRUSSES, BY R. F. LUXFORD. (ST) Strength tests were made on trusses with spans ranging from 17 to 32 feet, and with slopes from 5 in. 12 to 1 in. 12. It was found that glued trusses are stronger and stiffer than nailed trusses.

1840. GLUED LAMINATED WOOD CONSTRUCTIONS IN EUROPE, BY M. L. SELBO AND A. C. KNAUSS (ST) History and current status of wood laminating industry is reviewed. Adhesives, wood species and production methods are compared with U.S.A. practices.

PERMANENT STRUCTURES, BY C. MILES

1841. PRESSURE PRESERVED WOOD FOR BURPEE. (ST) This paper explains how modern science has developed preservatives that insure long service, how the evaluation of soil investigations can lead to the design of more economical foundations, and why pole-type buildings are becoming popular for industrial and commercial uses.

1842. HIGHWAY AND BRIDGE SURVEYS: PRELIMINARY BRIDGE SURVEYS, PROGRESS REPORT OF THE COMMITTEE ON HIGHWAY AND BRIDGE SURVEYS OF THE SURVEYING AND MAPPING DIVISION. (SU) This paper treats the details of conducting the surface and hydrographic surveys for long-span bridges over water and examines the requirements of the Geological and Foundation Survey.

1843. CHARTS FOR THE AIR FORCE, BY RICHARD W. PHILBRICK. (SU) Charts for the United States Air Force are published by the Aeronautical Chart and Information Center. The latest photogrammetric and cartographic techniques are used. About one hundred million charts a year are distributed throughout the world.

1844. THE STATE RESPONSIBILITY TOWARDS SURVEYING AND MAPPING, BY BURTON R. INGALLS. (SU) The state has a responsibility for an adequate surveying and mapping program. There is a need for a new type of service. A new type of state agency can provide this.

1845. THE ILLINOIS AND MICHIGAN CANAL STATE PROPERTY SURVEY, BY CHARLES D. MITCHELL. (SU) This paper gives the history of the Illinois and Michigan Canal and the present day problem of re-establishing the boundary lines with those made upon completion of the Canal in 1847-1848.

1846. PHOTOGRAMMETRY AIDS IN PIPELINE LOCATION SURVEYS, BY ALFRED O. QUINN. (SU) New techniques make photogrammetry an invaluable aid to pipeline location engineers. Combined use of aerial photography, topographic maps, and detailed studies of terrain helps to select feasible routes at minimum time and expense. Integrated photogrammetric programs provide the necessary basic surveying and mapping data.

1847. SLEUTHING THE BEHAVIOR OF A RIVER, BY EDWARD J. CLEARY. (SA) Seven years ago the Ohio River Valley Water Sanitation Commission instituted a program for systematic surveillance and appraisal of quality conditions and flow variations. The program is described in detail.

1848. FORESTS AND WATER YIELD, BY NEDAVIA BETHLAHMY. (SA) The paper reviews the problems involved in the yield of water from forest areas.

1849. ANAEROBIC CONTACT PROCESS FOR TREATMENT OF SUBURBAN SEWAGE, BY J. L. WITHEROW, J. B. COULTER AND M. B. ETTINGER. (SA) Pilot plant studies are described on an anaerobic contact process incorporating simplicity of design and absence of moving parts for treatment of domestic sewage. The process which produces an effluent low in B.O.D. and suspended solids is being developed for small groups of houses.

1850. AN ANALOG COMPUTER FOR THE OXYGEN SAG CURVE, BY MORTON D. SINKOFF, C. DON GEILKER, AND JAN G. RENNERFELT. (SA) The theory of an electrical analogy to the Streeter-Phelps oxygen sag equation is described. The analogy is applied in the construction of an instrument for use in the solution of exponential functions similar to the B.O.D.-time relationship and the oxygen-sag curve. The uses of such a computer in the field of stream pollution control are presented.

1851. ADMINISTRATION OF AIR POLLUTION CONTROL LAWS IN OREGON, BY RICHARD E. HATCHARD (SA) This paper presents the background of the Oregon Air Pollution Authority and its relationship with local agencies. Prevention and current needs as well as the role of the engineer are reviewed

1852. MUNICIPAL COMPOSTING IN THE UNITED KINGDOM, BY C. A. GORDON. (SA) Two municipal composting plants operating in the United Kingdom are described. The general trend in refuse disposal is outlined.

1953. SED RESEARCH REPORT NO. 21. SANITARY LAND FILL TESTS INVESTIGATING REFUSE VOLUME REDUCTION AND OTHER PHENOMENA, BY THE SOLID WASTES ENGINEERING SECTION OF THE SANITARY ENGINEERING RESEARCH COMMITTEE. (SA) The results of tests made to ascertain compaction, settlement, fill temperature, and gas production are presented. These data are reviewed with reference to obtaining optimum refuse disposal volume into a given landfill area.

1954. DESIGN OF PIER BENT AND RIGID FRAME, BY CHARLES P. C. TUNG. (ST) This paper presents the procedure of using moment distribution in the design analysis of pier bent or rigid frame by electronic computation. Sample solutions from the completed program, coded for the LGP, are illustrated.

1855. DISCUSSION OF PROCEEDINGS PAPER 1463, 1592, 1608, 1612, 1678, 1714, 1717. (SA) A. L. Danis closure to 1463. Remig A. Papp, Frank P. Coughlan on 1592. John W. Hamblen on 1608. Quintin B. Graves and Don Branscome closure to 1608. Gordon E. Mau on 1612. John R. Thoman on 1678. Harvey F. Ludwig on 1714. Thomas R. Camp on 1717.

1856. DISCUSSION OF PROCEEDINGS PAPER 1198, 1450, 1451, 1452, 1453, 1528, 1530, 1582, 1588, 1661, 1663. (HY) J. C. Stevens closure to 1198. J. M. Robertson on 1450. C. O. Clark on 1451. J. L. H. Paulhus and J. F. Miller closure to 1451. Donald P. Thayer on 1452. Robert B. Jansen closure to 1452. M. R. Carstens closure to 1453. A. J. Peterka and J. N. Bradley on 1528. James M. Robertson on 1528. Donald R. F. Harleman on 1528. Philip G. Hubbard on 1528. R. J. Garde and M. L. Albertson on 1530. D. C. Bondurant on 1530. John L. Bogardi on 1530. Marvin J. Webster on 1582. Quintin B. Graves and Don Branscome on 1588. E. Shaw Cole on 1588. Claud C. Lomax on 1588. H. Alden Foster on 1661. Gordon R. Williams on 1663. H. Alden Foster on 1663.

1857. DISCUSSION OF PROCEEDINGS PAPER 1353, 1355, 1356, 1562, 1567, 1630, 1631, 1633, 1636, 1637, 1638, 1696, 1710, 1722. (ST) James Chinn closure to 1353. Edward Cohen and Henri Perrin closure to 1355. Edward Cohen and Henri Perrin closure to 1356. Alexander Dodge corrections to discussion. Lembit Kald on 1567. Frederick H. McDonald on 1630. Victor R. Bergman on 1631. Octave W. Imer on 1633. Winfield H. Eldridge on 1636. John Reno on 1637. Yves Nubar on 1638. Zdenek Sobotka on 1638. I. Chen Chang on 1638. George W. Housner on 1696. Herbert S. Saffir on 1710. Dronnadula V. Reddy on 1722.

1858. DISCUSSION ON PROCEEDINGS PAPER 1697. (SU) William A. White on 1697.

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Journals: Hydraulics, Soil Mechanics, Structural, Professional Practices, Waterways and Harbors, City Planning, Power, Irrigation and Drainage.

1859. Meteorological Aspects of Storm Surge Generation, by D. Lee Harris. (HY) A hurricane model which describes the pressure and wind distributions, suitable for use in hurricane storm tide studies, is presented. Statistical relations between hurricane intensity and extreme tide heights are given.

1860. A Method of Financing Ground Water Replenishment, by Howard W. Crooke. (IR) A program of financing ground water replenishment by a dual tax structure that provides the major source of revenue is outlined in this paper.

1861. Statewide Water Planning, by Harvey O. Banks. (IR) This paper examines the importance of long-range planning in the development of water with particular reference to water development in California.

1862. Model Approach to a Ground Water Problem, by Kenneth R. Wright. (IR) When adverse field conditions preclude a direct field investigation of a ground water problem, models can be utilized to advantage to determine directions of flow, velocities, location of hydraulic divides, and to forecast conditions which may occur in the future.

1863. Settlement of Oil Storage Tanks, by Andrew W. Braswell, Jr. (SM) A review of the actual settlement of steel storage tanks with a description of the soil conditions at each tank is given. Construction procedures employed to improve foundation conditions are described, and a comparison is made of theoretical and observed settlements for the particular area.

1864. Design and Construction of the Ambuklao Rock Fill Dam, by E. Mont-

ford Fucik and Roert F. Edbrooke. (SM) The problems of designing and constructing a vertical-core rock fill dam are described in this paper. Records of settlement and seepage after operation at maximum reservoir level bear out the adequacy of design and construction procedures.

1865. Biaxially Loaded Reinforced Concrete Columns, by Kuang Han Chu and Algis Pabarcus. (ST) A numerical procedure is developed to determine the actual stress and strain distribution of a tentatively selected reinforced concrete section subjected to a given compressive axial load and bending moments in both directions about principal axes. The investigation is based on the ultimate strength theories of Jensen and Hognestad.

1866. Inspection and Tests of Welding of Highway Bridges, by John L. Beaton. (ST) The inspection techniques developed by the California Division of Highways for the control of the fabrication of welded highway bridges are examined. The use of radiography and other forms of nondestructive testing is outlined with special emphasis on the standards used to interpret the radiographic film.

1867. Direct Design of Optimum Indeterminate Trusses, by Louis M. Lau-shay. (ST) A direct design method is proposed for indeterminate trusses. The maximum possible compatible stresses are obtained for the bars. Redundant reactions and bar forces are selected to yield the minimum weight truss. Final bar areas then follow directly. Simultaneous equations and trial analyses are avoided. Design is emphasized, not analysis.

1868. Six Thousand High School Students View Engineering and Scientific Careers: Report of the Student Activities Committee, San Diego Section, ASCE. (PF) Our national professional engineering societies have expressed concern over

the engineering student shortage in our country. As a means of investigating the reasons for this shortage, a questionnaire was prepared. This paper presents the results of these questionnaires.

1869. Engineering Education as it Affects Unity in the Profession. by Frederick G. Lindvall. (PP) The present departmental educational pattern tends to exaggerate differences among fields of engineering and obscure for the student the common objectives and substance of engineering. Technological trends and the basic character of the appropriate education is examined.

1870. Pity the Poor Professors?—or Propagate Them!, by Jack McKee. (PP) The need for expanded and improved faculties of engineering is examined. Also considered are methods for retaining outstanding young engineers in the academic community, and action that can be taken by ASCE members.

1871. Importance of Emphasis in Civil Engineering Education, by L. E. Grinter. (PP) The tendency of new engineering students to choose electrical or aeronautical over civil engineering is explained by greater emphasis upon fundamentals of science and mathematics in these curricula which prepare their graduates for work on the frontiers of technology. A curriculum is presented for modernizing civil engineering education.

1872. Sputniks, Flopniks, and Engineering Education, by C. Ken Weidner. (PP) If we are to survive as a nation, we must produce creative thinkers, especially in science and engineering. Strong recommendations for achieving this goal are presented.

1873. Vertical-Lift Gate Design for Ice Harbor Lock, by Howard M. Rigler and Edmund H. Chun. (WW) This paper presents design details of the downstream lift gate for the Ice Harbor lock and some of the problems encountered. Also presented are the major features of the lock as a whole.

1874. Columbia Basin Streamflow Routing by Computer, by David M. Rockwood. (WW) A method for using a digital computer for streamflow routing in the Columbia Basin is described. A new routing technique is made possible by use of the computer.

1875. Financing of Sand By-Passing Operations, by Stephen R. Middleton. (WW) This paper presents information on the financing of twelve sand by-passing operations. Possible trends in the financing of work of this kind is considered and information is given on the problems and procedures in financing sand by-passing projects at various governmental levels.

1876. Motion of Sand Between Groins, by Shoshichiro Nagai and Hirokazu Kubo. (WW) Experiments on the motion of sand particles between groins were performed in a fixed basin to compare with the results of groins in a movable bed. The comparison proved that both results were in comparatively good agreement.

1877. City Planning Education for the Civil Engineer; Progress Report of the Committee on Education of the City Planning Division. (CP) The role of the city planner is essential in this era of expanding urbanization in which the problems of city planning and the need for trained city planners is receiving increased attention. Good opportunities for employment exist for those with training in principles and practice of city planning.

1878. Review of Limit Design for Concrete, by C. W. Yu and Eivind Hognestad. (ST) The development of limit design of reinforced concrete structures and various theoretical approaches are reviewed. Codes of practice of countries recommending limit design are quoted. The importance of incorporating limit design into future United States practice is stressed, and approaches toward this aim are suggested.